Chapter 3.
Cultural Overview

Prehistoric Occupants

Regional Perspective

The historic record for northern Ohio covers nearly 350 years, from the early journals of French and English explorers and missionaries to the present day. The period of human occupation of this area before written records is about 30 times longer—the Prehistoric Period (Figure 3-1).

Paleo-Indians. Pollen records for the Lake Erie basin show that the time between 13,000 and 9,000 YBP was characterized by major vegetational changes and, by inference, major climatic shifts (Shane 1994). As the ice retreated from the region, late-glacial warming led to the replacement of spruce forests by conifer-deciduous forests and the eventual elimination of conifer taxa on the plains surrounding the lake by 9,000 YBP (Shane 1994). During this time (13,000 to 11,000 YBP), the Paleo-Indians are thought to have entered the Lake Erie region, although there is some evidence of earlier occupation in limestone caves and rock shelters in western Pennsylvania (Adovasio et al. 1978) and on abandoned beach ridges of Lake Huron in southern Ontario (Ellis and Deller 1990, 2000). The environment was that of a boreal forest dominated by spruce and pine and human populations were most likely small and scattered (Shane 1987, 1994). Large mammalian species (Figure 3-2), such as woodland muskox (*Bootherium bombifrons*), American mastodon (*Mammut americanum*), elk-moose (*Cervaices scotti*), and giant beaver (*Castoroide ohioensis*) were present in the region at this time and are associated with boreal forest habitat (McDonald 1994). Paleo-Indians overlapped in time with these now extinct Pleistocene mammals and there is evidence they hunted them (Fisher et al. 1994). There is little to indicate the degree of impact such exploitation may have had on these animals, but overhunting and climate changes may have hastened their decline.

By 11,000 YBP winters were less extreme and summers were warmer in the Lake Erie region. Increasing diversity of vegetation and fauna would have provided multiple new environments to export and enhance sources of food and shelter for human populations. The Clovis peoples entered eastern North America during the late-glacial period, just prior to 11,000 YBP and may have been the first wave of colonizing people in the Lake Erie region (Tankersley 1994). The single most diagnostic lithic artifact of the Clovis culture is a fluted biface projectile point, referred to as the Clovis point (Agenbrood 1988). The Paleo-Indians were nomadic, probably living in small groups (40 to 60 people) that obtained most of their food from hunting with wooden spears tipped with distinctive fluted points made of flint.

One of the earliest, well-documented Paleo-Indian occupations in the Lake Erie region is the Paleo Crossing Site in northeastern Ohio dated at about 11,000 YBP (Brose 1994). This Early Paleo-Indian site is located in the Cuyahoga River valley, about 70 km south of Cleveland, Ohio and is thought to have been occupied between 10,000 and 11,500 YBP based on chert artifacts, post molds, granules of charcoal, and radiocarbon dating (10,980±75 YBP). The site is characterized by lithic artifacts, particularly projectile points of the "Gainey" style (Clovis occupation), and the waste flakes from the manufacture and/or use of these tools. The 2.4-acre (1-ha) site sits on a southern break below the crest of a glacial kame located just west of a series of glacial kettle lakes. The dates and style, variety, and lithology of the tools suggest that the site may represent the initial colonization of the Lake Erie drainage basin. Likewise, the Fisher Site in southern Ontario demonstrates early Paleo-Indian occupation (Storck 1997) in the lake region.

Other evidence of early human occupation in northern Ohio comes from excavations at the Anderson Site, situated on a bluff overlooking Old Woman Creek in Erie County (Figures 3-3 to 3-6). This site, which has been occupied off and on for the past 10,000 years, may have been attractive to prehistoric people because of its well-drained sandy soil and its strategic location above the creek valley. Because Lake Erie was at least 65 ft (20 m) lower than present when the Paleo-Indians occupied the site, there was no estuary in the valley as there is today (Herdendorf and Bailey 1989), but the

PREHISTORIC CHRONOLOGY

12,000 BC	Asian migrants cross Bering land bridge and enter New World.	PALEO-INDIAN
9500 BC	Fluted point came into use. Few Paleo finds exceed this date.	
9000 BC	Fluted point users spread over most of North America.	
8500 BC	Transition to Archaic Period. Descendants of Paleo-Indians lived a less nomadic life.	
8000 BC	Early Archaic. Marked by first use of side notched, bifurcated, and corner notched points.	ARCHAIC
6000 BC	Middle Archaic. Many new styles of hafting designs invented. First ground stone tools such as axes and pestles developed.	
2500 BC	Late Archaic. Increased sedentism, development of elaborate mortuary complexes such as Red Ocher and Glacial Kame.	
1000 BC	Early Woodland. Widespread use of pottery. First mounds built by the Adena people in southern Ohio.	WOODLAND
1 AD	Middle Woodland. Hopewell culture appears marked by geometric earthworks, trade routes, exotic material. After a few hundred years, Hopewell system breaks down.	
400 AD	Late Woodland. Appearance of first village sites in central and southern Ohio. Use of bow and arrow begins.	
1000 AD	Fort Ancient culture in southern Ohio. Sandusky and Whittlesey traditions in northern Ohio, and Monogahela in eastern Ohio. All live in large agricultural villages and subsistence was based on maize cultivation.	LATE PREHISTORIC
1650 AD	All prehistoric people had left Ohio and Ohio was without inhabitants.	HISTORIC
1750 AD	Many Indian groups such as Shawnee, Miami, Ottawa, and Wyandot move into Ohio from other areas.	

Figure 3-1. Chronology of Ohio's Prehistoric Indians (modified from Converse 1994).

Figure 3-2. American mastodon in an Ohio glacial bog (after Feldmann and Hackathorn 1996).

valley was probably a conduit for the movement of game and the upland terrain was rich in forest and grassland resources (Reeder and Eisner 1994). At the same time, Kelleys Island would have been part of the mainland (Figure 2-9).

Little remains of the camps of the Late Paleo-Indian hunters, other than their distinctive lanceolate-shaped spear points and perhaps the fire-stained stone cobbles scattered throughout their sites. No fireplaces, refuse pits or other facilities of the Paleo-Indians were found at the Anderson Site that would permit a direct way of determining the age of the occupation. However, the spear points that were found are like the lanceolate points found at the Squaw Rockshelter Site south of Cleveland (Brose 1989) and the Paleo Crossing Site in Medina County (Brose 1994). Archaeologists at the Cleveland Museum of Natural History have obtained radiocarbon dates ranging from 9,200 to 11,000 YBP for wood charcoal that was associated with the points.

From 11,000 to 10,000 YBP the climatic conditions in the region became more complex, with short-term temperature and moisture reversals in contrast to the gradual warming trends of earlier millennia. Increased mobility in human populations seems likely during this period because the landscape was no longer predictable from generation to generation. Prolonged drought conditions would have placed unprecedented stresses on human and animal populations (Shane 1994).

Later in the Paleo-Indian period, another group of hunters called the Plano Complex moved into northern Ohio from the west (about 9,500 YBP). Artifacts from this culture have been found associated with the abandoned beach ridges formed around the glacial lakes that once occupied the Lake Erie basin at levels up to 210 ft (64 m) above the present level of Lake Erie (Otto 1980, Herdendorf 1989).

Archaic Indians. The warming trend was re-established during the period from 10,000 to 9,000 YBP as climatic parameters approached modern values and gradients. Spruce, hemlock, pine, and larch either disappeared or were restricted to sheltered ravines; oak, hickory, walnut, and maple became the dominant trees.

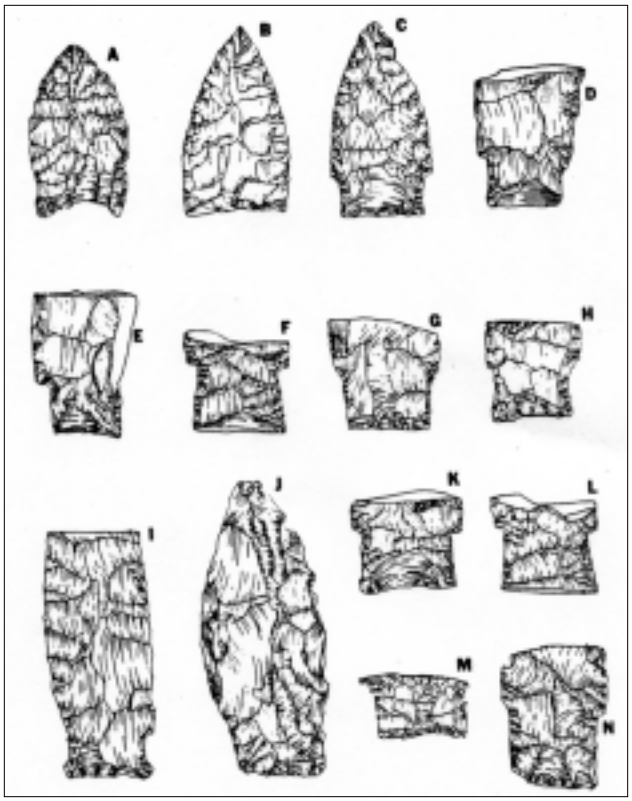

Figure 3-3. Late Paleo-Indian projectile points from the Anderson Site (after Shane 1981). A, B—Hi-Lo type points; C–N—Scottsbluff type points.

Later, 7,000 to 6,000 YBP, beech became important (Shane 1994). Human populations would have been affected by the loss of conifer forest, but the more diverse and plentiful fauna of the deciduous forest that replaced them and the milder winters would have also increased forage opportunities.

These new opportunities coincided with occupation of the region by people of the Archaic culture (Otto 1980) whose economy was based on hunting, fishing, and gathering. With the expansion of the deciduous forest into northern Ohio, Archaic Indian peoples adapted to the changing environment by developing new food sources and modifying technologies to utilize the resources of the newly established woodlands. In addition to hunting game, such as deer, they gathered plant foods, especially from nut-bearing trees (e.g. oak, hickory, and walnut).

The Ringer dugout canoe (3,600 YBP), found in the remnant of a glacial lake in Ashland County, Ohio at the head of the Vermilion River, which flows into Lake Erie, suggests that Archaic people were engaged in water-borne trade in the region (Brose and Greber 1982). This canoe is believed to have had a cargo capacity of about 1,170 lbs (530 kg) plus two crew members. Rather than the long-distance canoes of the later Woodland people (used to transport such commodities as copper, mica, flint, pottery, fresh conch shells, and salt), the Archaic canoe seemed best suited for local travel, carrying passengers and subsistence cargoes (Figure 3-7).

Most sites found in northern Ohio seem to have been small hunting camps. Typically these camps were located on a vantage point above a stream valley to maximize hunting efforts by utilizing blufftops as observation areas to locate and pursue deer moving through the valley (Abel 1994). The Weilnau Site on the Huron River in Erie County, Ohio has been interpreted as a seasonal hunting camp for these people

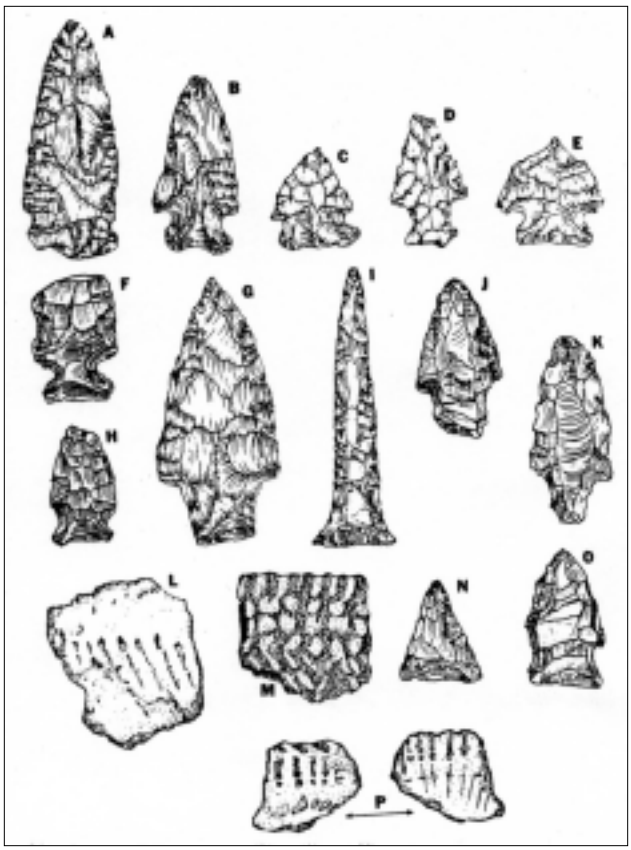

Figure 3-4. Archaic and Early Woodland artifacts from the Anderson Site (after Shane 1981). Archaic period: A–F, H—Brewerton side-notched projectile points; G—Genesee point; I—expanded base drill. Early Woodland period: J–K—stemmed projectile points; L,M,P—thick-walled grit-tempered cordmarked pottery; N,O—leaf-shaped chert bifaces.

Figure 3-5. Late Woodland artifacts from the Anderson Site (after Shane 1981). A–G—Madison triangular projectile points; H,I—pipe fragments; J—straight drill; K,L—"hump-backed" scraper; M–Q—ground slate celts.

(Abel 1994). Archaic peoples established hunting and fishing camps in various parts of their territories during different seasons of the year according to the availability of food resources.

In addition to chipping spear points and knives from flint, Archaic Indians developed a technique for making axes and various types of food processing tools. They tended to use hard rocks for these purposes, such as granite erratics which are abundant in the glacial deposits of the watershed and in the hollows between the ancient beach ridges (Campbell 1955, Herdendorf 1963). Lake Erie bifurcated-base and Stanley stemmed-base points found at the Weilnau Site (Abel 1994) indicated an age of 8,300 to 7,800 YBP, which corresponds to the Early Archaic cultural period in northern Ohio, whereas Brewerton side-notched and Genesee projectile points from the Anderson Site indicate Late Archaic peoples (5,000 to 3,500 YBP).

The Weilnau Site, located on a high bluff overlooking the Huron River valley in Milan Township, Erie County, Ohio contained a habitation structure and projectile points associated with the Early Archaic period (Abel and Haas 1991, Abel 1994). The habitation structure consisted of a shallow, circular depression (3.2 m in diameter) surrounded by post molds. A cluster of fire-cracked rocks near its center was interpreted as a hearth. Abel (1994) interpreted the Weilnau Site as a hunting camp. The site offers a clear view of the broad floodplain and meanders of the Huron River, some 65 ft (20 m) below. The valley constricts immediately downstream of the site forming a bottleneck for game moving in that direction. Abel postulated that Early Archaic hunters used the bluff tops near the site as observation points to locate and pursue deer and other game moving through the valley. The habitation structure and the hearth suggests cold-weather occupation of the camp (probably autumn), when deer are most mobile and best hunted. The Huron River valley was probably utilized heavily by deer during these seasons, especially since the river rarely

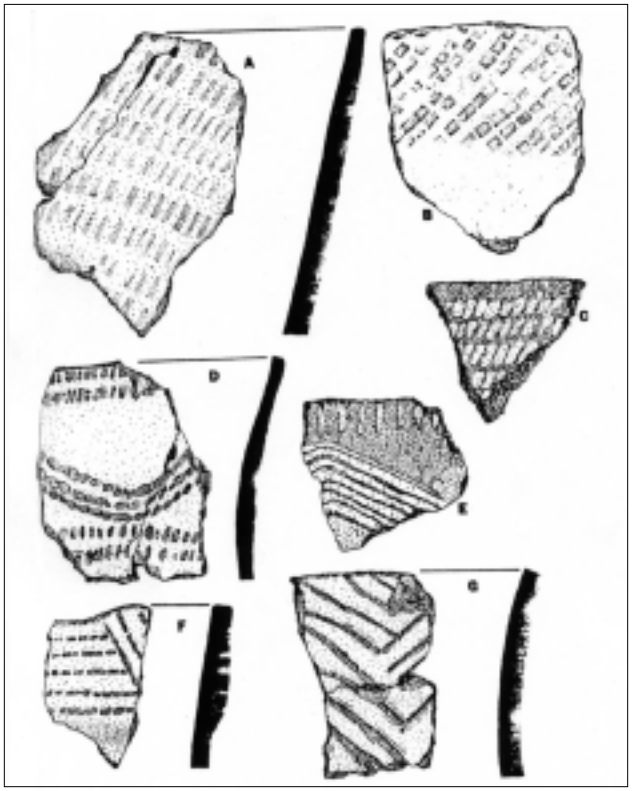

Figure 3-6. Late Woodland ceramic types from the Anderson Site (after Shane 1981). A–C,F—Mixter tool-impressed sherds; D,E,G—Parker festooned sherds.

Figure 3-7. Engraving of American Indians making a dugout canoe (after Harriot 1590).

freezes below the site under current climatic conditions and most certainly was ice-free during the mild temperatures of the Climatic Optimum (8,000 to 6,000 YBP).

Woodland Indians. About 3,000 YBP the way of life of Indian people in much of eastern North America began to undergo a fundamental change, largely in response to the domestication and cultivation of plants. With crops to supplement food traditionally obtained by hunting and gathering, they were able to establish more or less permanent villages. Fired, clay pottery also appeared at this time, permitting resources to be stored, which also favored more permanent settlements. Thus, these peoples began to follow a yearly round of activities, in part controlled by the need to come together in summer to plant, cultivate, and harvest crops. Many archaeologists call this last 3,000 years of eastern North American prehistory the Woodland Period (Shane 1992).

One of the most extensively documented and perhaps the single most important aboriginal wild plant food source associated with the embayments of Lake Erie was wild rice (*Zizania aquatic* and *Z. palustris*). Wild rice constituted a food staple for most Algonquian- and Siouan-speaking tribal groups living in the Great Lakes region (Keenlyside 1978). The occurrence of "once abundant stands" of wild rice at Point Pelee and Long Point, Ontario may have been one of the primary attractions for late prehistory aboriginal peoples.

At first, Woodland farmers cultivated only indigenous Midwestern plants for their seeds, such as the marsh elder (*Iva*), lamb's quarter (*Chenopodium*), gourd (*Largenaria*), and perhaps sunflower (*Helianthus*); these crops were later replaced by cultivated corn, beans, and squash introduced from Mexico (Shane 1992). Perhaps for the next 2,000 years, cultivated plant foods supplemented a subsistence

economy based on hunting, gathering, and fishing. By about AD 900, Indian farmers became reliant on corn, beans, squash, and sunflower for a significant portion of their food (Prufer and Shane 1976). At about the same time bows and arrows came into common use for hunting.

The major village at the Anderson Site was occupied during the 15th century, late in the Woodland Period. Although the villagers grew corn, as evidenced by the carbonized kernels recovered from village refuse pits, the large amounts of animal remains and nut shells indicate that farming may have been less important to the village economy than hunting, fishing, or gathering. Evidence for angling with hook and line at the Anderson Site includes polished bone fishhooks. Fish from Lake Erie and its estuaries were probably also taken with nets, traps, or spears. Although little archaeological evidence remains of these devices at the Anderson Site such devices were found at the Harbour Site (Late Woodland–900 YBP) on Pipe Creek where it flows into Sandusky Bay, Erie County, Ohio. While only the remains of catfishes, northern pike, and freshwater drum were recognized at the Anderson Site, 27 fish species were identified at the Harbour Site by Cavender and Bowen (1994), demonstrating an extensive use of the Lake Erie fishery; identified species included:

Ambloplites rupestris (rock bass)
Ameiurus melas (black bullhead)
Ameiurus natalis (yellow bullhead)
Ameiurus nebulosus (brown bullhead)
Amia calva (bowfin)
Aplodinotus grunniens (freshwater drum)
Coregonus artedii (cisco)
Erimyzon sucetta (lake chubsucker)
Esox americanus (grass pickerel)
Esox lucius (northern pike)
Esox masquinongy (muskellunge)
Ictalurus punctatus (channel catfish)
Lepisosteus osseus (longnose gar)
Lepomis gibbosus (pumpkinseed sunfish)
Lepomis macrochirus (bluegill sunfish)
Micropterus dolomieui (smallmouth bass)
Micropterus salmoides (largemouth bass)
Minytrema melanops (spotted sucker)
Morone chrysops (white bass)
Moxostoma anisurum (silver redhorse)
Moxostoma cariinatum (river redhorse)
Moxostoma erythrurum (golden redhorse)
Moxostoma macrolepidotum (shorthead redhorse)
Notemigonus crysoleucas (golden shiner)
Perca flavescens (yellow perch)
Pomoxis annularis (white crappie)
Sander vitreus (walleye)

The Harbour Site fish assemblage represents the shallow, nearshore waters habitat of Sandusky Bay and the deeper waters of Lake Erie about 900 YBP. Many small and medium sized fishes were present along with some very large individuals. The wide size variation and high diversity indicates capture by trap or seine, a hypothesis that is supported by the recovery of netsinkers at the site. Collection grounds with relatively firm, unobstructed bottom conditions were probably selected close to the village. The dominance of adult pumpkinseed sunfish suggests these were taken during the early summer spawning season when adults are easily captured in shallow water by seining. Some open water species were present, but most share an affinity with shallow, vegetated margins of the bay. Other vertebrates identified from refuse pits and middens at the Harbour Site, such as muskrats, ducks, turtles, and frogs, agree with the fishes in habitat preference (Cavender and Bowen 1994).

Studies of animal bones from prehistoric Indian habitations in northern Ohio show that white-tailed deer was the single most important game animal for the Woodland people (Shane 1992). In addition to meat, deer provided hide for clothing, bone and antler for tools and utensils, sinew for thread and binding material, and brain for tanning. Elk, raccoon, rabbits, bear, and wild turkey were also hunted in the upland forests. Beaver, muskrats, and waterfowl were taken from the wetlands. Wild plants from the wetlands along the shore embayments of Lake Erie and from the upland forests appear to have provided at least half of the foods eaten by Woodland people. Nuts, numerous kinds of seeds of herbaceous plants, and greens were collected from the forest, as were many medicinal plants. Hickory nuts, in particular, were crushed and boiled in water to release their oil, which was collected and used as margarine. Wetland plants provided raw material for making mats, baskets, bags, house coverings, and a great many other wood utensils. Cattails, bulrushes, the inner bark of basswood, and elm were important materials.

Fired clay pottery vessels and smoking pipe bowls were fashioned from clay probably collected

from a source along Lake Erie tributaries (Shane 1992). Pots were unpainted and were decorated along the rim with bands of simple rectangular tool impressions. Oval post-mold patterns, floor depressions, and hearth structures at the Anderson Site indicate that Late Woodland houses were similar to the 17th to 19th century dome-shaped lodges or "wigwams" built by Ottawa and Sauk Indians of the western Great Lakes region. These houses probably consisted of oval pole frames, covered with various available kinds of tree bark and bulrush or cattail mats.

Late Prehistoric and Contact Indians. The last prehistoric culture to inhabit northwestern Ohio is known as the Sandusky Tradition, which presumably arrived from the south about 1,000 YBP. Contemporary groups of Indians living in northeastern Ohio are known as the Whittlessey Tradition and in southern Ohio as the Fort Ancient Culture. Members of the northern culture may have been the ancestors of the Erie Indians who were reportedly destroyed as a group in northern Ohio by the marauding Iroquois from western New York in 1654 (Otto 1980). These people inhabited small villages built on promontories on high banks overlooking streams that emptied into Lake Erie. Erie communities were fortified with palisades and exterior ditches.

Late Prehistoric Indians used the bow and arrow for hunting. The proximity of the lake and rivers to villages enabled these people to fish extensively, both with hooks and with nets. Their nets were weighted with rounded pieces of stone, particularly slate which was roughly notched on opposite edges for attachment to the nets (Otto 1980). Erie people also cultivated corn and collected wild plant food and mussels.

Around 500 YBP the northeastern shore of Lake Erie was inhabited by ancestral Neutrals, followed by the Neutrals and Tobacco Indians about 400 YBP (Addison 1994). These peoples were also subdued by the Iroquois Indians, as were the people of the Huron Nation who resided to the north around Georgian Bay. Archaeological investigations indicate that both the Neutrals and the Iroquois occupied a relatively small area between Lakes Erie and Ontario and used the hinterlands of the north shore as hunting grounds (Burns 1985, Ellis and Ferris 1990). These groups represent the region's Contact Indians. However, there were very few Indians living along the north shore of Lake Erie when the first Europeans began to move through the area in the late 17th century (Noble 1978). Likewise, the south shore had very few aboriginal inhabitants at this time.

ABORIGINAL OCCUPATION ON KELLEYS ISLAND

Considering that Lake Erie water levels were significantly lower from 10,400 to 3,000 YBP (Figures 2-8 and 2-9), to the point where Kelleys Island was connected to the mainland (Holcombe et al. 2003:696-700), the island has the potential of encompassing sites which represent the complete temporal range of human occupation in the Great Lakes region. A Paleo-Indian fluted projectile point was recovered on Kelleys Island by Prufer (1960) and Archaic Indian materials, including beveled adzes are reported by Schoolcraft (1852) and Pape (1988). An Early Woodland component is represented by a quadra-concave gorget from Site 33ER356 on the eastern shore (Pape 1988). However, these periods of occupation are only represented by meager evidence. In contrast, Late Woodland occupation of Kelleys Island is represented by substantial archaeological data. The most prominent among sites of this period are 2 enclosed villages on the south shore (33ER18 and 33ER22).

The prehistoric archaeological resources of Kelleys Island have been recognized for nearly 200 years. In the early 19th century "Inscription Rock" was discovered along the south shore of the island. This petroglyph (33ER17) represents one of the finest examples of aboriginal art in the Great Lakes and is now maintained as a state historical monument (Pape 1988). The presence of this 30-foot slab of limestone was reported to government authorities, who responded by commissioning Capt. Seth Eastman of the U.S. Army to map the island's prehistoric resources (Schoolcraft 1852). Inscription Rock may tell the story of the Erie Indians and pictures their annihilation by the Iroquois (Fisher 1922; Vietzen 1945:43-46, 1965:69). Eastman surveyed the island in the 1840s and noted 2 earthen enclosures, 7 mounds, and 2 petroglyphs (Krebs 1980:10). Whittlesey (1877) excavated several other prehistoric sites including a burial mound on the northeast side of the island about 800 ft (240 m) south of the base of Long Point (33ER20, Whittlesey Mound) recovering Mid-Late Woodland lithic artifacts. Mills (1914) noted 2 additional mounds in his classic *Archaeological Atlas of Ohio*. Prahl (1974) conducted subsequent excavations at Whittlesey Mound in which Late

Woodland Parker festooned pottery was recovered. Krebs (1980) conducted a random subsurface survey throughout the island and generated 35 additional subsurface sites, mostly indicating Woodland occupation. Of 106 test pits opened by Krebs, 67% were sterile, containing no evidence of prehistoric occupation; for Long Point, 6 out of 8 locations were sterile.

Pape (1988) reported that during the aboriginal occupation of Kelleys Island, groups first made use of its prime location as a fishing station; later, more sedimentary groups may have exploited the agricultural potential of its long growing season (200+ days); finally, the island served as a convenient "stepping-stone" for proto-historic fur traders crossing between the north and south shores of the lake (Figure 3-8). Approximately 60 prehistoric archaeological sites from the island are reported on Ohio Archaeological Inventory forms, 2 of which are located on Long Point (33ER101 and 33ER102). Artifacts found at the former site (Thomas Jones Site #1, located near the tip of Long Point) consisted of "4 limey chert chunks," while at the latter (Thomas Jones Site #2, located on the southeast shore of the point about 2,700 ft (820 m) south of the tip), included "2 chert chunks, 2 trimming flakes, 1 secondary decortication flake, 1 chert backed knife, and several small pieces of charcoal" (Krebs 1980). Another site, near the base of Long Point (33ER107, Boy Scout Campsite), yielded "2 flake cores, 2 chert chunks (one burned), 7 shatter flakes and pieces, 3 trimming flakes, and 2 secondary decortication flakes" (Krebs 1980).

Western Lake Erie is noted for the annual spawning of fishes in its shallow nearshore waters. Prahl (1974) concluded that the prehistoric inhabitants of Kelleys Island were probably seasonal occupants, exploiting the late spring and early summer lacustrine resources (fish and shellfish). They were not particularly concerned with hunting or gathering in the hardwood forests, thereby explaining the lack of settlement within the well-drained, higher elevated inland soils; rather, aboriginal settlements tended to

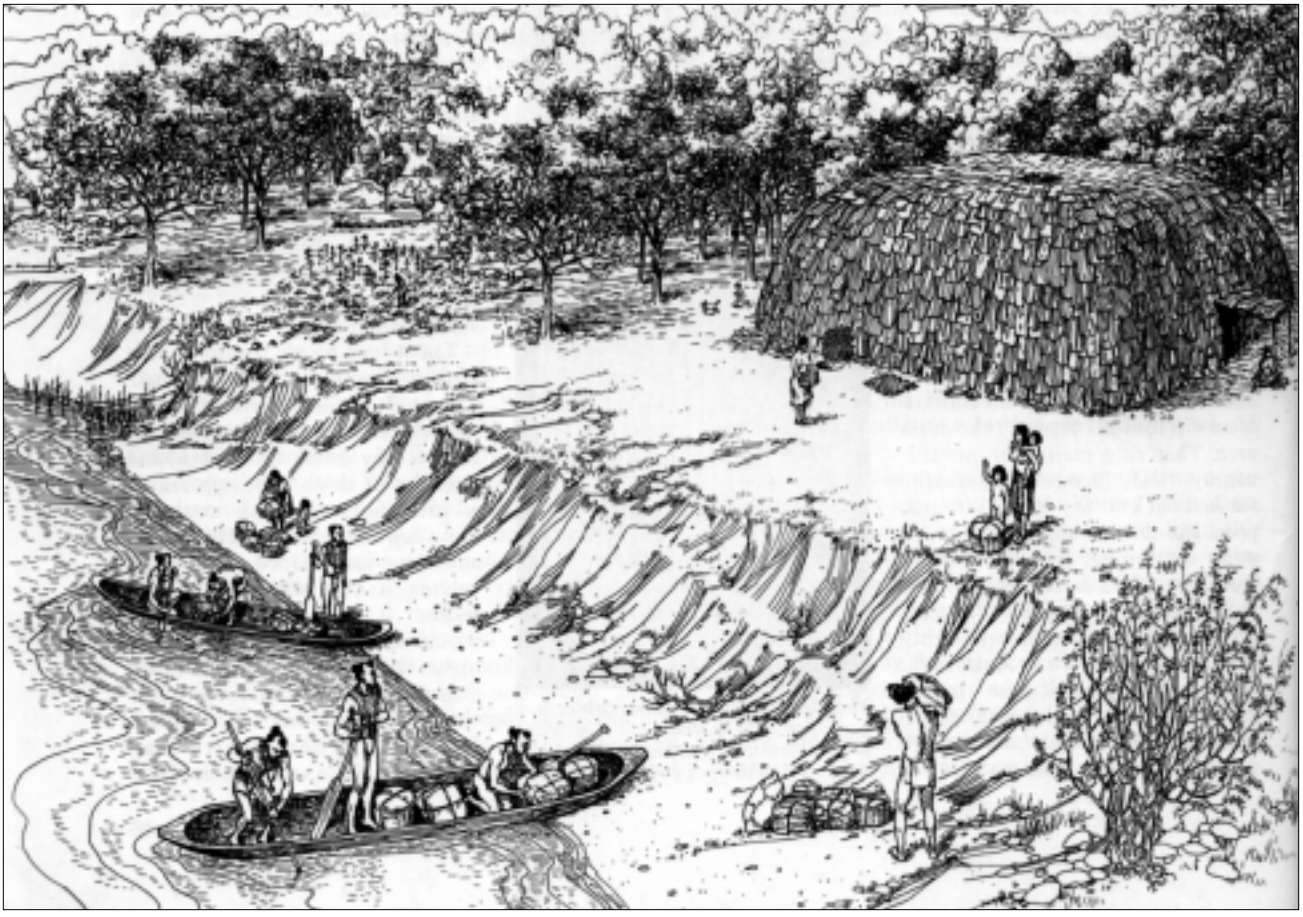

Figure 3-8. Depiction of a Woodland Indian shore village in northern Ohio (after Maxwell 1978).

be on the leeward side of the island (south and southeast) and cluster along the shore on seasonally swampy soils that dry up in late spring (Krebs 1980:92).

Historic aboriginal occupation of Kelleys Island, like the earliest Paleo-Indian occupation, is inferred from circumstantial evidence rather than direct site documentation. However, numerous documentary references to the aboriginal use of the island during historic times suggest the potential for the presence of sites from this time period (Pape 1988).

HISTORIC OCCUPANTS

CULTURAL HISTORY OF KELLEYS ISLAND

When the Kelley Brothers purchased the island in 1833, only 6 acres (2.4 ha) of land had been cleared by squatters, who were soon ejected (Morrison 1950:108). The forests, particularly red cedar (*Juniperus virginiana*), provided the first income, with minor contributions from quarried limestone and agriculture. In 1836 the island produced 3,248 cords of steamboat wood worth $4,102 and 714 cords of red cedar valued at $4,291. Also exported were 390 cords of limestone sold for $780 and corn, wheat, and pork worth about $2,000. Cedar posts and other building materials were marketed at the larger Lake Erie ports, while boiler wood was sold to passing steamers. The forests were soon cleared and by mid-century it was necessary to import firewood for cooking and home heating. At first wheat was the leading crop, but by 1860, grapes had become the main source of income.

Viticulture. After the collapse of the Ohio Valley vineyards in the 1860s, the Lake Erie Islands Region gained a reputation as the nation's leading center for the production of fine wines and champagnes from the American type grape (Morrison 1950:110). The first vines were planted on Kelleys Island in 1842 and the in 1851 the first winery north of Cincinnati was opened on the island. In 1858 only 16 acres (5 ha) of grapes were under cultivation. Expansion was rapid with 367 acres (112 ha) in 1861 and peaked in 1874 with 650 acres (263 ha) of bearing grapes. The development of viticulture on the island was hastened by the arrival of German settlers from wine districts in the old world who recognized the island's favorable climate and lime soils as extremely suitable for grape production (Ver Steeg and Yunck 1935:432). Land that cost the Kelleys $1.50 per acre, was sold to the first settlers for $50 to $100 per acre, but once grape production was realized it rose to $1,000 per acre in a few years.

During most years between 1860 and 1875, grapes were the most valuable single product of the island. In 1859 the crop was valued at $8,000, then increased dramatically to $150,000 in 1862 (Morrison 1950:110). Average yield of 3 to 4 tons per acre were obtained in good crop years, with prices as high as 10 cents per pound. Most of the grapes were made into wine on the island, but considerable amounts were exported for both wine making and table use. Over 100,000 gallons of wine were made on the island in 1867; of this, 63,000 gallons were the product of the largest winery, the Kelley Island Wine Company, established only 2 years earlier. By 1872, there were 26 commercial wine makers on the island who produced 126,000 gallons of wine, valued at 60 cents per gallon (Morrison 1950:111). However, toward the end of the century viticulture was eclipsed by the limestone industry, as the Kelley Island Lime and Transport Company acquired about 40% of the islands land area. Passage of the 18th Amendment, which ushered in Prohibition (1920-1933), nearly ended the viticulture industry on the island.

Limestone Industry. For seven decades, from 1873 to 1939, quarrying was the leading industry on Kelleys Island (Figure 3-9). Even earlier, around 1830, the first quarry was opened by John Clemons (Martin 1990a:18). He and his brother exploited rock from the north shore of the island where limestone ledges rose 25 ft (7.6 m) above the lake (Myers et al. 1992:22). The first shipments of limestone were made from a dock on North Bay that was constructed by Clemons (Ver Steeg and Yunck 1935:432). Although temporarily abandoned about 1835, the general vicinity of the first quarry was utilized at various times by various firms until its final abandonment in the early 1940s. This site is now part of Kelleys Island State Park and the location of the impressive glacial grooves carved in the limestone bedrock.

The potential for developing a limestone quarry industry on Kelleys Island was one of the factors which prompted Datus and Irad Kelley to purchase the island in the 1830s and members of the Kelley family remained involved in the industry until the turn-of-the-century. When the Kelley brothers purchased most of the island in 1833, several families were resident on the island and employed in quarrying. The Kelleys

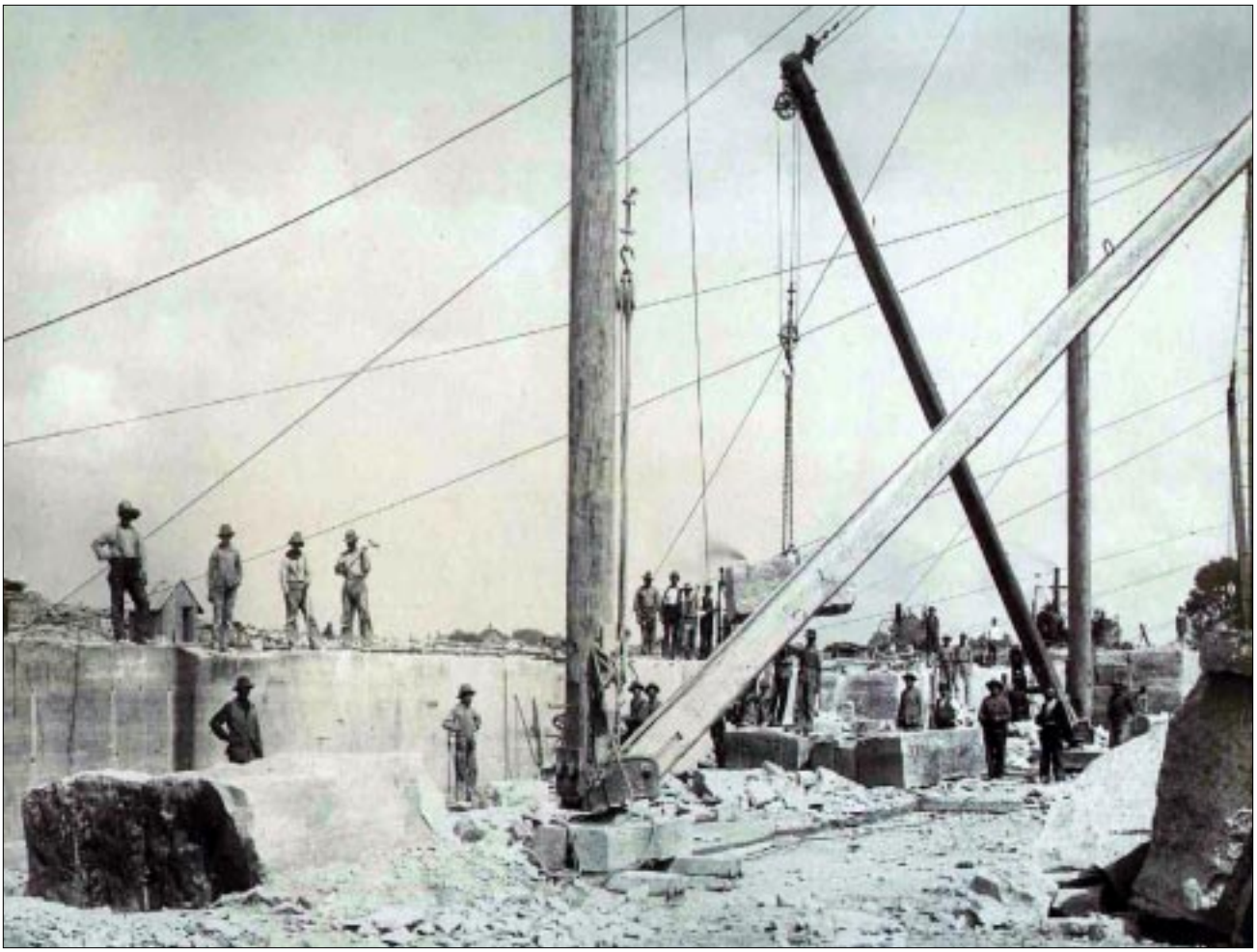

Figure 3-9. Kelley Island Lime & Transport Company's quarry on Kelleys Island, Ohio, ca. 1900; note large dimension stone being hoisted from the quarry floor (Remick Collection, courtesy Georgann and Michael Wachter).

continued to use the north dock to ship stone, making their first shipments to Cleveland and other markets in 1834. The Kelleys shifted their quarrying activities to the southern side of the island in 1835 and use of the North Bay quarry and dock were temporarily discontinued (Myers et al. 1992:22). Other early quarries were soon opened on various parcels of land near the west and south shores by settlers who had purchased land from the Kelley brothers, including William S. Webb, George W. Kelley, A. S. Kelley, George C. Huntington, Charles Carpenter, and John Titus, who owned and operated their own quarries (Martin 1990a:18). Datus Kelley wrote of William Webb's early efforts, "Our teams are now busy in hauling stone...Esquire Bill is elected Justice of the Peace. He has quarried about 7 or 8 hundred feet of stone at 6¢ per foot. Says he will quarry all we want." (Graff 1941:81).

The original quarry on the north shore was variously known as Lake Shore, North Bay, or Kelleys Quarry. Other early operations were known as Carpenter Quarry near the southwestern corner of the island, the Huntington or South Side Quarry on the south shore, and the Titus or West Side Quarry on the west shore. These early quarries were small in areal extent in response to limited markets.

George Kelley, son of Irad Kelley, arrived on the island in 1847 to occupy 140 acres of land in Lot 6 that he had purchased four years earlier from his cousin, Addison Kelley. He operated a general store, but in 1854 traded his business to William S. Webb in exchange for Webb's quarry. George Kelley opened several small quarries in various places on the island and built a dock on the south shore for shipping his stone. Here the keel for the steamer *ISLAND QUEEN*

was laid in July 1854 (Martin 1975:66). In May 1865 Franklin and Norman Kelley purchased all of the remaining quarries and docks owned by William S. Webb and A. S. Kelley. This was the beginning of the consolidation of the Kelleys Island quarries (Martin 1975:25).

Quarrying on the southern and western sides of the island developed rapidly in the 1850s and 1860s (Hatcher 1940:382) and more workers were attracted to the island. However, the production of limestone remained eclipsed by the commercially successful viticulture industry until late in the 19th century when market factors depressed the grape and wine economy. Only then did land values, once inflated by vineyard profits, decline to a level where large-scale land acquisitions for quarry ventures were practicable (Pape 1988). Finally in 1873, the value of stone exceeded that of the grape crop for the first time. Thereafter, stone increased in importance while the vineyards gradually declined (Gilfillan 1959:20). William D. Kelley, manager of the South Side Quarry and 31-year veteran of the island's limestone business, observed that production in his quarry increased from 500 cords/year in the 1850s to 20,000 cords in the 1880s (Nichols 1888:22).

Quarrying activities resumed again on the north side of the island in 1872 when G. W. Calkins & Co. of Cleveland purchased 162 acres of quarry land from William. D. Kelley and others to compliment their smaller holding on the west side of the island. Until the purchase of the North Bay quarry land, Calkins & Co. shipped stone extracted from their west quarry to Cleveland to be burned for lime (Myers et al. 1992:22). Soon after the new land acquisition the company initiated an expansion program which included a new dock, enhanced facilities for extracting and processing stone, and housing for quarry workers. In 1875 the company brought several lime kilns to the island from their Cleveland operation and erected them near the new north dock (Figure 3-10). The same year an extensive cooper shop was built and an elevated wharf was added to the North Bay dock (Myers et al. 1992:23). At this time the company was owned by G. W. Calkins, M. C. Younglove, and Charles Hickox.

In December 1886, Calkins & Co. was incorporated as the Kelley Island Lime & Transport Company (KIL&T Co.) with M. C. Younglove, Cable E. Gowen, and E. B. Merriam as partners. KIL&T Co. consolidated the holdings of the island's smaller operations into three "theaters" of operation: North Bay, West Bay, and South Bay. KIL&T Co. became the largest employer and landowner on the island between 1886 and 1942, and eventually became the largest producer of lime in the world (Pape 1988). In describing the island at the turn-of-the century, Thorndale (1898) noted that "after a glance at the vast area of quarries and cored stone, and the outcropping ledges remaining, the island as a whole suggests itself as a single big lime rock, with a layer of earth spread over it." In 1918 KIL&T Co. reached peak production on Kelleys Island as 3,989,339 tons of stone were shipped on 316 boats (Myers et al. 1992:24).

The population of Kelleys Island from the mid-1800s to the mid-1900s fluctuated largely in response to quarrying operations on the island. The peak period of island population (approximately 1,400 inhabitants) corresponds to the peak period of limestone production, from about 1870 to 1920. At the turn-of-the century over half of the occupations on Kelleys Island were directly related to the limestone industry (Myers et al. 1992:35).

Quarrying was easy and economical on Kelleys Island because the loose thin soil could be rapidly removed from above the limestone. Because the basal beds of the Columbus Limestone were best suited for dimension stone, deep quarries were the first to be developed. These quarries produced massive stone used for buildings, piers and breakwaters. In addition to building stone, the early quarries were soon organized to produce lime (calcium oxide). Lime replaced dimension stone in the 1870s with the construction of large kilns and dominated operations for three decades. By the early 1900s the focus changed from the production of lime to the that of flux stone, an important ingredient in the manufacture of steel. To produce this type of stone, large stone crushing complexes were built on the island. With the decline in the demand for dimension stone, and the expense of deep quarrying for lime rock, the deeper parts of the quarries were abandoned. By the 1920s, only the thin-bedded upper zone was being utilized and that for crushed stone.

Kelleys Island dimension stone was sold by the cord, a cord being equivalent to 5.5 tons. Several docks were built and used for shipping both stone and cedar wood. Thus, numerous boats were able to dock at the

island to purchase stone. A typical early cargo would amount to 50 or 60 cords of stone. The breakwaters at Cleveland and Cedar Point were constructed with Kelleys Island limestone, as well as the piers for the Cleveland High Level Bridge. The first American lock at Sault Ste. Marie, Michigan (1874-1876) was also built with Kelleys Island stone (Martin 1975:25). Ross (1949:39) points out that "the islanders are proud of the fact that many churches in Detroit, some of the finest office buildings in Cleveland, and the Poe lock at the Soo were built of stone taken from the island."

The early methods of quarrying on Kelleys Island were largely performed by hand. Until the 1880s the steps in the stone extraction process included drilling, black power blasting, and hand sledging. Blast-hole drilling was done with a single-jack (one man with a chisel and 4-lb (1.8-kg). hammer creating a 3-ft (1-m) deep hole or double-jack (team of three laborers, one to hold drill and two to alternately strike it with 20-lb or 9-kg hammers). Hand-chum drills and hand augers that could reach a depth of 8 ft (2.4 m) were also used. Dimension stone, stone for lime burning, and flux stone were all quarried with the same tools (Myers et al. 1992:27). The difference in their extraction was related to the size of the rock to be removed and this was controlled by the spacing and depth of the blast holes.

In the late 1880s the mode of quarrying was mechanized with the introduction of the steam drill. Drill holes were filled with powder and single set of blasts would free as much as 400 cords of blue-white stone, remarkably free of spots or impurities (Nichols 1888:22). Steam drills at that time consisted of a piston drill that was an extension of the cylinder of a steam engine. These drills were powered by steam supplied by piping from a remote boiler (Myers et al. 1992:27). Piston drills were capable of drilling holes up to 15 ft (4.6 m) deep.

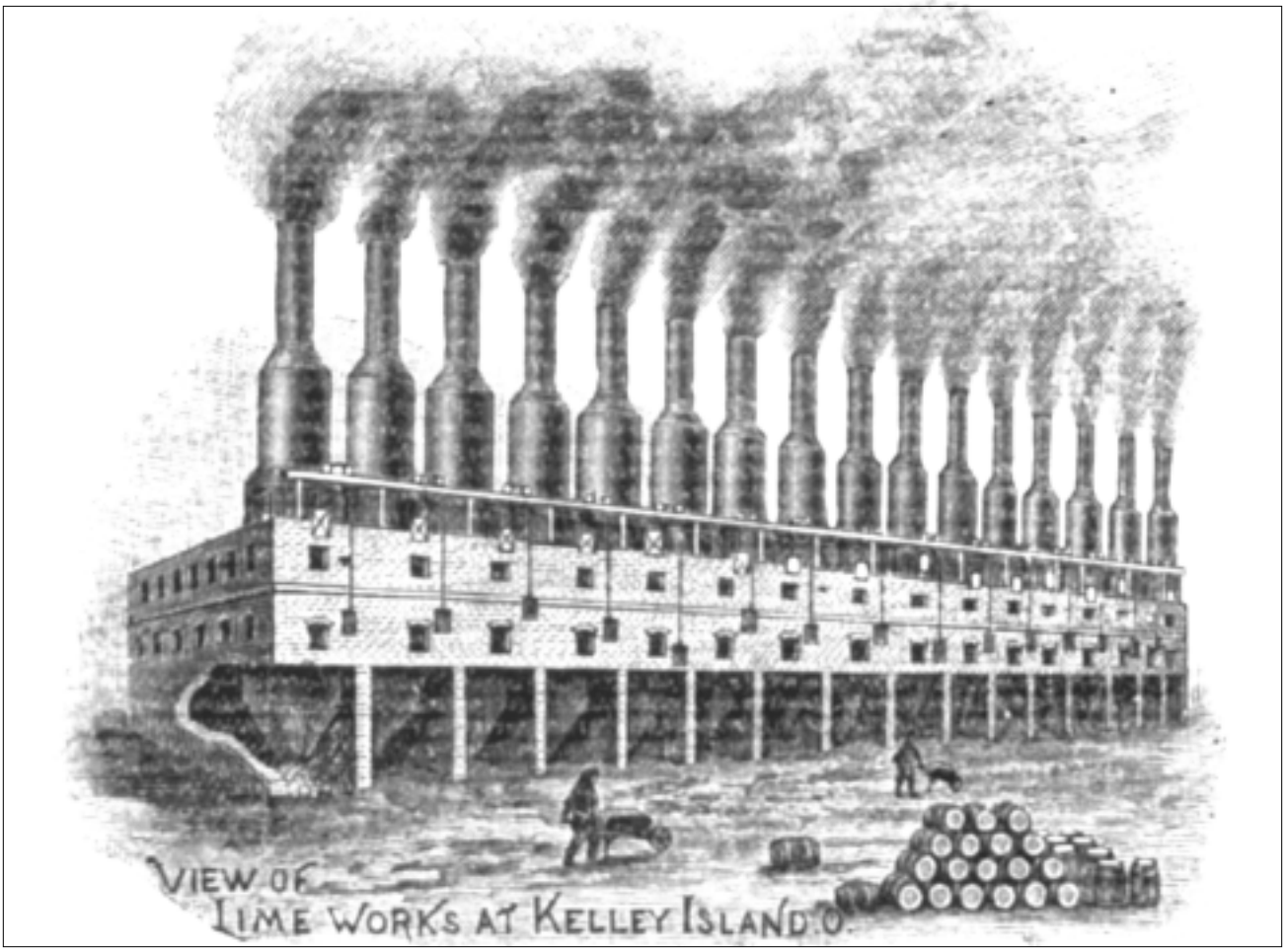

Figure 3-10. Woodcut of Kelley Island Lime & Transport Company's lime kilns at North Bay quarry, ca. 1888; note stacks of wooden barrels on stone floor at base of kilns (after Nichols 1888).

As a secondary product of dimension stone quarrying, the broken blocks of the lower beds were burned for lime. These pieces had a higher magnesium content which required less heat to burn than the more calcareous upper beds (Fisher 1922:21). The Lake Shore quarry furnished both the magnesium-rich portion of the Columbus Limestone and underlying beds of Lucas Dolomite, also rich in magnesium, for the lime kilns.

The first lime kilns on Kelleys Island were built on the south shore by George Kelley in 1855 (Pape 1988, Myers et al. 1992:30) and by Calkins & Co. on the north shore in 1875 (Behnke 1974:7). In 1886 a huge complex of lime kilns was positioned at North Bay by the KIL&T Co. when the demand for building stone declined. Nichols (1888:23,24) describes the early operations of the KIL&T Co. in vivid detail. Within two years, KIL&T Co. laid five miles of railroad track on the island and operated two locomotives and 15 cars to haul the stone to the kilns and to the docks for shipment to commercial centers. At the quarries KIL&T Co. employed a stationary engine and two diamond drills while at North Bay it built 16 state-of-the-art iron kilns to burn the limestone. KIL&T Co. also constructed residences for its employees and established a general merchandise store as the center of Kelleys Island village was 1.5 mi (2.4 km) distant. In all, KIL&T Co. invested about $300,000 during its first two years of operation.

Twenty years later, KIL&T Co. holdings covered over 1,000 acres and over $800,000 had been invested in its operations. The Company advertised itself as "the largest of its kind in the world" (Hatcher 1949:304). To work the quarries and kilns, KIL&T Co. imported foreign workers from central and eastern Europe—Italians, Slavs, Greeks, Hungarians, Portuguese, Poles, Macedonians, Bulgarians, and Germans. A large group of them lived on Kelleys Island, others in the vicinity of Marblehead. In the late 1930s, the workings on the island began to dwindle, along with the population, and the industry was concentrated on Marblehead Peninsula.

The kilns were so constructed that the stone was conveyed by car or wagon to the mouths of the kilns, which were constructed on the same level as the quarry floors. The kilns burned about 80 cords of stone and 48 cords of wood per day. Once the supply of wood on the island was used up other sources were developed. Nichols (1888:24) noted that "an inexhaustible supply [of wood] being obtained from the Canadian shore, just across the lake." Wood for the kilns was also obtained from Oak Harbor on the Portage River in Ottawa County, Ohio.

After burning to drive off carbon dioxide, the lime (calcium oxide) was drawn out at the base of the kiln onto a substantial stone floor where it was packed into wooden barrels. The barrels were then rolled to an adjacent warehouse (6,000 capacity) or on shipboard as vessels laid along side the warehouse dock. The kiln-dock complex included a large cooper shop where 22 men were employed in making and repairing barrels. The annual lime production by KIL&T Co. in the late 1880s was about 650,000 barrels and involved some 275 workers. Nichols (1888:23) observed that "the lime produced by this firm is singularly white, strong and pure, being used almost exclusively for building and plastering purposes." In referring to the thinly bedded rock overlying the lime beds, Nichols also pointed out that "above the famous limestone being a valuable and extensive strata of what is termed 'flux stone' used in the process of purifying metals, which commands a ready market all over the continent."

When limestone, a carbonate of calcium ($CaCO_3$), is heated sufficiently it undergoes a decomposition which yields calcium oxide and carbon dioxide ($CaCO_3 \rightarrow CaO+CO_2$). The temperature required to maintain this conversion at one atmosphere of pressure is about 1,250°F (Nebergall et al. 1963:650). The manufacture of calcium oxide or quicklime on Kelleys Island was carried out in tall chimney-like furnaces, known as kilns. In a continuous process, the limestone, which was fed in at the top of the kiln, was heated and decomposed by a draft of hot gas, and the lime was drawn off at the bottom of the kiln. The blast of hot gases through the furnace kept the partial pressure of the carbon dioxide at a minimum and permitted the reaction to go to completion at a much lower temperature than would otherwise be required. In the furnace, carbon dioxide began to disassociate at 700° F and was completely freed at about 900° F. Operators attempted to maintain a constant temperature of 800° F in the kilns for optimal processing (Myers et al. 1992:30). Wood was typically used to fuel the Kelleys Island kilns.

Pure calcium oxide is a white amorphous substance that emits an intense light, called "limelight"

when heated to a high temperature. Lime reacts vigorously with water and exothermally (releasing heat), forming a hydroxide ($CaO+H_2O\rightarrow Ca(OH)_2$+15,500 calories) which is known as hydrated lime or slaked lime (Nebergall et al. 1963:651). Because lime is a perishable product, particularly susceptible to the deleterious effects of moisture, the most convenient and safe way to ship the product from Kelleys Island was in water-tight barrels.

During the first decade of the 20th century the 16 North Bay kilns were running at full capacity, producing 1,600 barrels of lime per day. KIL&T Co. then employed about 500 men and 50 horses. By the second decade of the century, the Company found it cheaper and more convenient to ship the stone, and then burn the lime at its plants in Duluth, thus the focus of its operation changed from the production of lime to the production of flux stone. At this time, the Kelleys Island kilns and cooperage on North Bay were torn down (Ryall 1913:188).

To produce flux and other types of crushed stone, two large stone crushing complexes were built, one at North Bay and one at South Bay. Crusher plants, storage bins, and railroad grades are still extant at these two sites. The large scale production of flux stone also required a sizable inventory of narrow gauge rolling stock and steam cranes (Figure 3-11). A machine shop, blacksmith shop, locomotive shed, and ancillary sheds were established at West Bay to accommodate maintenance and repair of these components and an office building/general store were built at the North Bay quarry complex.

In the early 1920s, the upper part of the Columbus Limestone was quarried by drilling a row of holes 25 ft (7.6 m) back from the working surface, 25 ft apart, and 15 ft (4.6 m) deep. Charges of dynamite were set in these holes and the entire mass was "shot down" (Fisher 1922:22). The stone was loaded by steam shovels into dump cars and hauled to crushers where it was broken and graded according to size.

At that time crushed limestone had three primary uses: (1) flux, (2) road ballast and metal, and (3) the main constituent of concrete. As flux, the stone was used in smelting iron and copper, and in the manufacture of bottle and window glass. Fisher (1922:21) provided the following descriptions: "flux stone had to pass through a 4-in ring, but be retained on a 2-in ring; ballast stone had to pass through a 2-in ring, but be retained 0.75-in ring; concrete stone had to pass through a 1.25-in ring; and for surfacing roads, all that passed through a 0.75-in ring, including dust was used."

The rapid falling off in demand for building stone in the late 1800s and the increase in demand on crushed stone for lime, flux, and road building made it more economical to quarry only the thin bedded upper rock and just some of the "bottom rock" of the Columbus Limestone. Ver Steeg and Yunck (1935:432) noted "as a result almost the whole top of the island is being removed from west to east; the average depth of the vast quarry is twenty-five feet."

Because the upper thin-bedded limestone was generally less than 20-ft (6-m) thick, the later quarries tended to expand over great areas without attaining much depth. By the early 1920s KIL&T Co. owned about 40% of the island and most of their holdings had been opened to quarries the thin-bedded upper strata. The islanders began to resist any attempts on

Figure 3-11. Whirly steam crane loading dimension stone at Kelley Island Lime & Transport Company's North Bay quarry, ca. 1900 (Captain Frank E. Hamilton Albums, Rutherford B. Hayes Presidential Center).

the part of KIL&T Co. to obtain more land, fearing that practically the whole island would be devastated by extension of the quarries (Fisher 1922:23). Thus, quarry operations began to dwindle and KIL&T Co. went out of business on the island in 1942.

HISTORICAL RESOURCES OF KELLEYS ISLAND

The entire land mass of the island has been designated as the Kelleys Island Historic District. For the purpose of establishing the District, the period of significance covers the temporal span between the earliest human occupation and the time of World War II, when the Kelley Island Lime & Transport Co. ceased operations on the island. After this period, the viability of the island's economy declined and most new homes were built by seasonal residents (Pape 1988).

Kelleys Island retains elements of the major building styles from the mid-19th to mid-20th century. Initial settlement of the island came from the Kelleys and their associates, predominately of English/Irish descent from New England, who brought with them a concept of building derived from that region. Thus, the Greek Revival style dominates the island's architecture, with examples ranging from 1840s to 1870s. The great success of grape agriculture and wine making during this period is responsible for many fine homes and other structures. Most of the buildings utilized during subsequent periods were built with money generated by the wine industry (Pape 1988). Although later quarry operations employed a greater number of workers, profits were not concentrated in the hands of the individual entrepreneurs as the were during the viticulture period. Other prominent styles represented on the island include: Italianate, Gothic Revival, Queen Anne, Second Empire, Richardsonian Romanesque, and Tudor.

In establishing the historic district for Kelleys Island, descriptions of historical properties were subdivided according to streets and roads. Monagan Road leads to Long Point and as such the description of developments along this road are relevant in understanding historic utilization of the Predevelopment, Ltd. property. Considering its 1.7-mile (2.7-km) length, Monagan Road has been the most sparsely developed road on the island through the historic and into the contemporary periods. Monagan Road was built in two segments: the first, which runs from Woodford Road north to the lake at North Bay was established around 1855; the second segment was laid out to the northeast along the shore of North Bay to the tip of Long Point in 1865 (Pape 1988). Named for the Monagan family, whose house (ERI-1758) was located on Woodford Road near the intersection, this lane provided the farms on the east side of the island with access to shops and docks on the south shore. Thus, development was concentrated to the east of the road, closer to the lake rather than along the road itself. Also, land use along the road was varied due to soil characteristics and depth to bedrock. The east side of the road was agricultural and dominated by vineyards while the west side, because of shallow soils, was left either in woods, devoted to pasturage or used by fishermen to dry their nets (Lawson 1877, Morrison 1950:112). One of the largest and most prosperous farms on the island was owned by the Hamilton family and was located at the base of Long Point (ERI-1663), near the northern terminus of the first road segment. The original house has been modified as a summer camp (Camp Patmos).

The second segment of Monagan Road was constructed to service the farms of Joseph Lincoln and James Watkins, sons-in-law of John Titus, an early quarry operator. In 1839 John Titus acquired land from the Kelley brothers and arrived on the island with a large family of unmarried children, followed by sons-in-law soon after: Edmund Ward, Joseph Lincoln, Sylvester S. Dwelle, James Watkins, James Hamilton, and Jesse E. Woodford, who had been on the island since 1837 (Hills 1925:39). Surveyed by Judge Jabes Wright in 1817, the original owner of Long Point was Uriah Tracy of Norwich, Connecticut. Long Point consisted of 140 acres out of a total 444 acres Tracey owned on the eastern side of the island. On August 31, 1836, the Kelley brothers purchased all 444 acres from the heir of Uriah Tracy, through General Simon Perkins, attorney, at $1.50/acre (Hills 1925).

The Lincoln and Watkins families maintained orchards and vineyards on their Long Point farms in the 1870s (Morrison 1950) and James Watkins purportedly operated a small lime kiln about 2,000 ft (600 m) south of the point's tip. The houses of these two families had limestone foundations which are still extant (33ER499, Watkins Site and 33ER521, Lincoln House Site). The Watkins house foundation lies to the north of the Predevelopment, Ltd. property and was documented by Grooms and Bergman (2001), while the Lincoln House foundation is located near the center

of the Predevelopment, Ltd. property and is documented in this report.

Another interesting historic feature of Long Point is the Lincoln Stone Wall or Long Point Stone Wall (ERI-1664). This dry-laid, limestone slab wall runs along the inland (southeast) side of Monagan Road from the start of the second segment, near the Samuel Bauman house (ERI-1662, c. 1860), to about 2,300 ft (700 m) south of the tip of Long Point, a distance of approximately 3,600 ft (1,100 m) with several gaps of varying lengths. Details of the Lincoln Stone Wall within the Predevelopment, Ltd. property are contained in the results section of this report.

In the late 1990s, much of the terminal end of Monagan Road was abandoned to provide a more undisturbed habitat for the threatened Lake Erie watersnake and a new access roadway was constructed farther inland to the tip of the point. The new 3,900-ft (1,200-m)-long private drive has been recently renamed Long Point Lane by the Village of Kelleys Island.

Maritime History of the Region

Aboriginal Use of the Lakes

At least 13,000 years ago Paleo-Indians occupied various parts of the Great Lakes region (Halsey 1990). Even as hunters and gatherers, or as semi-agriculturists, they modified the environment with the sites of their villages, mines, and refuse heaps (middens). Their primary means of transportation was on foot, or on water via dugout and later birch bark canoes (Brose and Greber 1982). Waterborne transportation had the advantage of requiring minimal effort to propel people and their possessions both long and short distances. The watercraft also provided the primary means of access for certain types of resources, particularly food (such as wild rice) and fishing. The efficiency of their watercraft was such that they were quickly adopted by the Europeans who trickled into the region in the seventeenth century.

Kelleys Island was connected to the mainland by a land bridge to Catawba as recently as 3,000 YBP (Holcombe et al. 2003:700), making access to the island by prehistoric peoples a simple matter. Since that time the island has been separated from the mainland an communication was most likely maintained with the use of watercraft (Figure 3-7), at first probably with vessels similar to the Ringer dugout canoe (Brose and Greber 1982).

European Settlement and Early Lake Trade

The early history of European settlement of the Great Lakes and the maritime activities that developed in association with them is closely linked to the rivalry between France and England which was fostered by the mercantilist policies of the time. The acquisition of colonies was the major priority of the mercantile system—a concept that the economic well-being of a country could best be maintained and improved by using the rising merchant class to exploit the natural resources of colonial possessions. Thus the merchants paid the bill for exploration, settlement, and the acquisition of further colonies as a profit making venture, while the mother country became the sole source of trade (Glick and Martin 1998).

European influence in the Great Lakes basin started with the Frenchmen who began fishing stations at the mouth of the St. Lawrence River as early as the 15th century and later expanded their economic interests to include the harvesting of furs. Aggressive trade with native inhabitants soon resulted. French voyageurs pushed up the rivers and streams of New France to trade manufactured goods for valuable beaver pelts. As this trade grew, voyageurs pushed westward, exploring as they traded, starting with Lake Huron in 1615 and culminating with Lake Erie in 1669 (Mansfield 1899). Thus, the fur trade represents the first notable form of Great Lakes commercial shipping. This trade was carried on in canoes of 30 to 40 ft (9 to 12 m) in length that were adapted from aboriginal designs, but built on a larger scale and were manned by a dozen or more men.

The growing demand for furs led to the first attempts to create a more extensive commerce on the lakes and rivers of the region. Rene Robert Cavelier (known as LaSalle) arrived in Canada in 1665 and built a series of four small vessels on Lake Ontario to improve communication and trade with Lake Erie. LaSalle's first large vessel was built in 1679 at a shipyard on the Niagara River with the intent of sailing the upper lakes to collect furs at distant outposts for shipment back to Montreal and Quebec. Despite difficulties with both his own men and the Indians, the vessel was launched and named the *GRIFFON*. The 60-ton vessel was of European design, with a shallow

draft hull for exploring the uncharted waters of the Great Lakes. The vessel was approximately 50 ft (15 m) long, carried two masts, and was armed with several cannon (Mansfield 1899). In the summer of 1679 the vessel made her first voyage; LaSalle sailed westward the length of Lake Erie passing Kelleys Island, up the rivers connecting Lake Erie to Lake Huron, across northern Lake Michigan, and into Green Bay. There LaSalle disembarked and the *GRIFFON* took on a cargo of furs for transport to Lake Erie. She sailed eastward in September 1679 but never reached her destination, apparently sinking on one of the three lakes on her route.

After the American Revolutionary War, vessels were built on both shores of Lake Erie and a small but flourishing commerce developed. The transport of furs for the American Fur Company and supplies for wilderness towns and fortifications constituted the bulk of this trade. The fledgling government of the United States realized that communication with its scattered northwest outposts was essential to maintaining control of the region and in 1796 purchased the schooner *DETROIT* from the Northwest Fur Company for that purpose. The burgeoning waterborne commerce on Lake Erie was noted in Congress by establishing the Buffalo Creek customs district in 1805 to collect duties on transported merchandise (Mansfield 1899).

EARLY 19TH CENTURY

During the War of 1812 Lake Erie was of critical strategic importance. The British quickly secured Canada's southern boundary against incursion of the Americans through the establishment of strong fortifications and a highly mobile Great Lakes fleet. Naval operations on the lake came to a climax on September 10, 1813, when Commodore Oliver H. Perry and his squadron fleet defeated a force of enemy vessels under British Commodore Robert H. Barclay at the Battle of Put-in-Bay. Perry's victory forestalled a British invasion of the western United States and allowed General William Henry Harrison and his forces to defeat the British army under General Henry Proctor, retake Detroit, and defend the western frontier (Welsh and Skaggs 1991).

The end of the War of 1812 brought only a tenuous peace. Both sides had learned the importance of maintaining a well-armed military establishment along the Great Lakes frontier. This led to a post-war arms race. A partial solution for peace was achieved by an exchange of official notes between the British minister to the United States, Charles Bagot, and acting United States Secretary of State Benjamin Rush, in 1816 and 1817. Although never ratified by Congress, these notes collectively became known as the Rush-Bagot Agreement and limited the number, size, type, and armament of the naval vessels of both countries on the lakes (Glick and Martin 1998).

The post-war decades brought a considerable increase in activity in the region. In 1816, Lake Erie ports and Detroit boasted about 50 vessels totaling 2,067 tons. By 1825, there were only 30 to 40 sailing craft and one steamer, but the combined tonnage was up to 2,500. This initial drop in the number of vessels was more than offset by the larger tonnage of those that entered service, indicating larger vessels were being built and that shipping was slowly developing as more people emigrated to the region in search of land and business opportunities (Glick and Martin 1998).

Since the rivers and lakes of the region offered a less expensive and more effective transportation network than the primitive overland highways, a considerable trade developed in the shipment of merchandise from the cities of the east to the new settlements of the west. This trade continued to grow and prosper as time went on, and was increasingly supplemented by a trade from east to west in merchandise and manufactured items, and west to east in agricultural products. Unfortunately, this trade was stunted by the high cost of transportation caused by the need to portage cargoes around natural obstructions such as Niagara Falls and the rapids of the St. Lawrence River. Canals were envisioned as a solution to this problem. Although the idea of an all-water route to the east was considered before the War of 1812, it was not until 1817 that a route was laid out across New York State starting from the western terminus near Buffalo and traversing the state to the ocean port of New York City. Known as the Erie Canal, it took over eight years to build and was finally completed on October 26, 1825. The canal extended 585 km from Buffalo to the Hudson River, and another 240 km to New York City (Mansfield 1899). The Erie Canal provided a much cheaper and more efficient means of exporting farm products and building materials from the west to eastern markets, thereby markedly increasing the ability of western farmers to compete effectively. The

opening of the canal further increased the tide of immigration in the region. Cheap transportation westward brought thousands to take advantage of the unclaimed and inexpensive lands of Ohio, Michigan, and Wisconsin. The tide of immigration was led by citizens of the New England states, New York, and Pennsylvania who traveled west looking for farm land and other economic opportunities. Large numbers of Norwegians, Swedes, and French-Canadians immigrated to the area to work in the lumber industry, commercial shipping, or the fisheries. Other immigrants included Germans, Irish, Dutch, and English settlers, many of whom came by way of the Erie Canal and the Great Lakes.

The Erie Canal was not the only man-made body of water to influence the development of the region. The opening of the first Welland Canal in 1829, connecting Lakes Ontario and Erie (Jackson 1988), and the Saint Marys Falls Ship Canal in 1855, connecting Lakes Huron and Superior, provided the final connecting links to bring all five Great Lakes together as one trade network. The Miami and Erie and other Ohio canals assisted in connecting the lakes with the Ohio River valley creating an even bigger territory that could have access to the markets of the Great Lakes basin. The success of these canals made it possible for the midwest to become an important force in the economy of the United States.

Increasing lake trade created the need for more and larger vessels. The first steam-powered vessel to be built in the region was the British vessel *FRONTENAC*, which was launched on Lake Ontario in 1816; next came the American vessel *ONTARIO* in 1817 on the same lake. These early steam vessels demonstrated the ability of steamers to operate efficiently on open waters.

In 1818, the *WALK-IN-THE-WATER* (Figure 3-12), built at Black Rock, New York, became the first steamer on Lake Erie and proved to be successful (Wendt 1984). This vessel traveled at about four knots, running a steady schedule between Buffalo, Erie, Cleveland, Sandusky, and Detroit, making the round trip in 9 to 10 days and consuming 36 to 40 cords of wood on the way (Schoolcraft 1821). By 1851 the round-trip time for a steamer from Buffalo to Detroit had fallen to only 3 to 4 days. Wood to fuel the boiler of these early steamers was cut from the cedar forests on Kelleys Island. Hills (1925:133) reports that the *WALK-IN-THE-WATER* stopped at the island for wood in 1818 on her trip between Detroit and Buffalo; when the this vessel discontinued going into Sandusky Bay, Captain Coit ran a sailboat ferry to convey passengers from Sandusky and Venice to-and-from Kelleys Island to connect with the steamer.

Even as the technological efficiency of Great Lakes steamers increased, the development of commerce was hampered by the lack of adequate harbors. Lake Erie has few good, natural harbors, most having been developed only by extensive dredging of sand bars at the mouths of rivers and the construction of massive breakwater structures. Federal improvement of Great Lakes harbors began with Erie, Pennsylvania in 1824 and in 1826 Congress authorized the U.S. Army Corps of Engineers to conduct surveys of lake harbors (Larson 1995).

Bathymetric and meteorological conditions on the Great Lakes influenced the evolution of specialized vessel types operating on the lakes. The first sailing vessels used on the lakes were modeled after saltwater types. Brigs, barks, and a few ship-rigged vessels were at first utilized, but later the schooner rose to prominence as its shallow draft, high maneuverability, and low labor costs proved more desirable.

MID 19TH CENTURY

The schooner rig was further adapted to meet the specific conditions and types of trade prevalent on the lakes. Stubby, vertical-bowed vessels with hinged bowsprits were built with dimensions to allow them to transit the Welland and other canals. By the 1840s, most schooners, and even some steamers, were constructed with shallow draughts and fitted with one or more centerboards, a device that could be lowered into the water through an opening in the bottom of the vessel to enhance sailing qualities. The board could be retracted to allow the vessel to enter the shallow harbors and rivers where it needed to load and discharge cargo (Barkhausen 1990).

There were advances in steamboat technology in this era as well. In 1842, the first screw-propelled vessel on the Great Lakes, *VANDALIA*, was launched at Oswego, New York. This vessel was the fourth vessel built with John Ericsson's patent screw propeller and the first large boat to be fitted with the invention. She quickly demonstrated the efficiency and applicability

of this invention to the lakes and soon a large number of steamers using propellers instead of side-mount paddle wheels were in common use on the lakes (Wright 1969).

Other technological advances in shipbuilding developed to meet the need for improved connection with the markets of the east. These advances included steam engines that provided faster and more dependable service and hulls constructed to fit the locks of the Erie and Welland Canals. The resulting increase in transportation efficiency and the decline in cost of transportation made western lands more attractive for settlement. As the farm products of the Great Lakes region flowed eastward and finished products flowed westward from east coast cities, increasing immigrant trade developed. Foreign immigrants often traveled from the east coast via canal boats; once they reached Buffalo or another lake terminus they could transfer to a steamer or a sailing vessel and reach almost any point on the Great Lakes in a few weeks, as compared to months for an overland journey (Glick and Martin 1998).

There were dangers inherent in traveling on Lake Erie onboard both sail and steam vessels. Harbors remained largely unimproved until after the Civil War and vessels frequently grounded when passing through narrow channels. Sailing vessels were more likely to be wrecked through a combination of sudden storms and the poor navigational charts and equipment of the time. Steamers had the additional tendency to be overcome by fire and boiler explosions.

Water transportation was a critical factor in the movement of materials from and into the Lake Erie area. In terms of exports, lumber became a prime resource for the area as early as the 1830s as some eastern lumber resources were being exhausted. The copper and iron ore of the Superior area were being mined early on, but could not be adequately exploited and transported to Lake Erie ports until the opening of the canal at Sault Ste. Marie in 1855. Limestone and coal were also major cargoes as were wheat, corn, and other agricultural products.

Commercial fishing appeared on Lake Erie by the 1830s. Although the region's vast fisheries had been

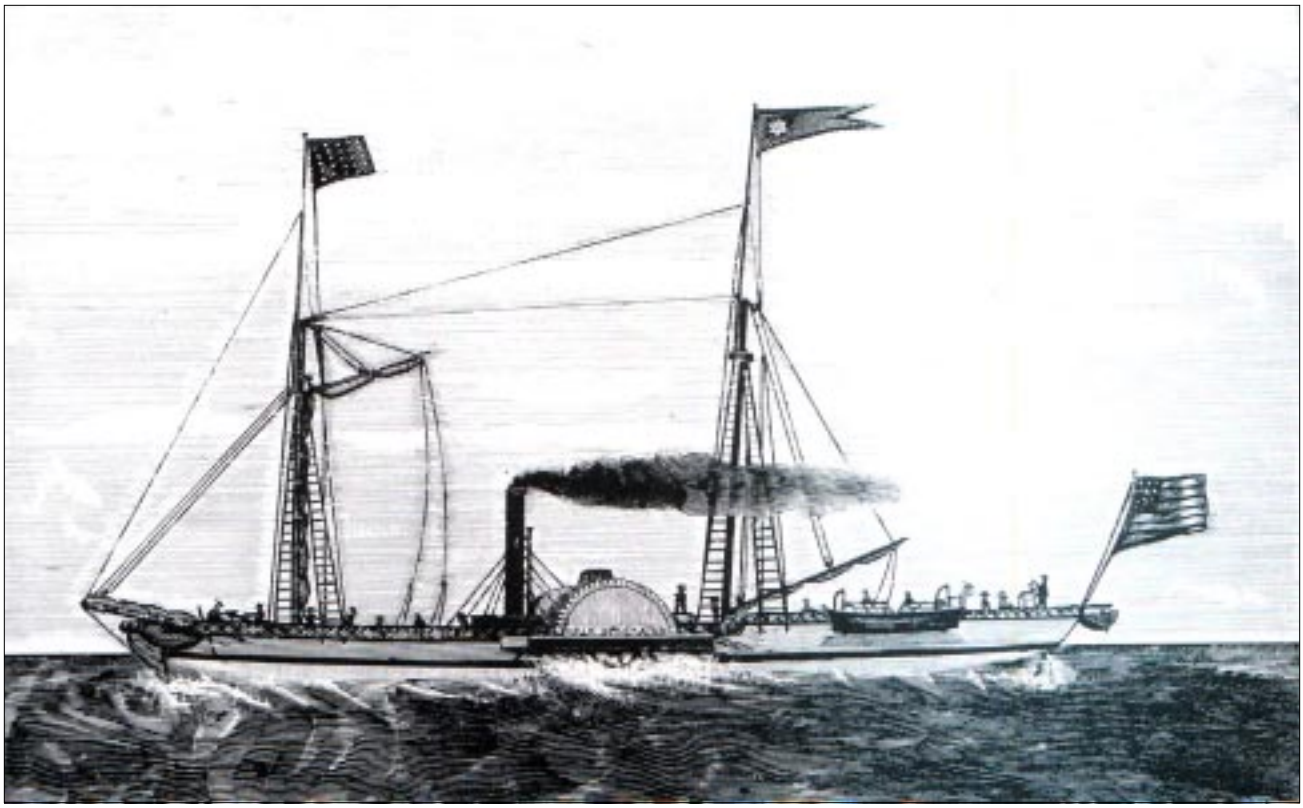

Figure 3-12. Sidewheel steamer WALK-IN-THE-WATER*, the first steamboat to operate on Lake Erie (after Wendt 1984).*

well exploited by both Indians and Europeans for centuries, it was not until the massive immigration of the mid-19th century that a sizable commercial fishery developed. The original fisheries were largely shore based with seines and other nets used in shallow waters. Later rowing boats, then steam and motor tugs were introduced. Fishing stations had been established on Lake Superior and on Lake Huron by 1833. At that time fish were packed in salt to preserve them for the trip to market, but later ice was substituted as transportation techniques improved the speed with which perishable products could be delivered to market in various Great Lakes cities. By the 1850s the fishery had become a major Great Lakes industry (McCullough 2000).

Recovering from the financial panic of 1857 (Stampp 1990), the Civil War brought an increased tempo of trade to the Great Lakes as the industrialized North geared up to battle the agrarian South. Since the lakes were not located near to the direct geographic area of the conflict, they became a relatively safe transportation network. Raw materials and agricultural products necessary for the war effort could be transported on the lakes more efficiently than by rail. Steam power made its first major advance against the more numerous sailing vessels at this time, and continued its ascendancy throughout the late 19th century. The end of the Civil War heralded the beginning of an extended period of growth and development in Lake Erie ports, industry, and commercial shipping. The return to a peacetime economy was not without its recessions and depressions, but in general, the waterborne commerce of the lakes grew with the increase in population and the development of a more industrial economy.

The most important industry to come to prominence in the post-war era was the American steel industry. The Great Lakes played a critical role in the creation of the steel industry. Not only was water used in the processing of steel products, the lakes and rivers from which the water was taken provided the cheapest and most efficient natural transportation network available to get raw iron ore from the mines of northern Minnesota to the steel mills in Ohio and Pennsylvania. Other components of industrial manufacture, stone, lumber, cement, plaster, and aggregate for building materials, were efficiently shipped by water on the lakes. Coal, the primary fuel of the late 19th century, was a major cargo moved by rail from the mines of Pennsylvania, Kentucky, and Ohio to Lake Erie where it was transshipped to the cities of the industrial north via lake freighters. Grain cargoes also continued to be a staple of an ever increasing Great Lakes trade in bulk commodities.

LATE 19TH CENTURY

Growing competition from the increasingly more efficient lakes steamers and the liberal use of government funds to improve Great Lakes ports spelled the end for many vessel types. Sailing vessels were seen in fewer numbers on Lakes Erie and Ontario, but continued in service at the smaller and less improved harbors of Lakes Huron and Michigan well into the 1890s. In 1930, the passing of the last commercially-operating Great Lakes schooner was marked by the sinking of *OUR SON* on Lake Michigan. Other sailing vessels that were no longer profitable were reduced to schooner-barges—vessels with shortened masts and decks cluttered with deck winches and towing gear—that spent their last years being towed.

The growing efficiency and reliability of lake steamers landed them the majority of cargo transportation by the later decades of the 19th century. The special lake conditions and the particular cargoes carried on the lakes led to a further specialization. The first vessel to take on the form of what is now considered a traditional Great Lakes bulk carrier was the *ROBERT J. HACKETT*. Built at Cleveland, Ohio by Peck & Masters in 1869, this vessel had her pilot house far forward, her cargo hold amidships, and her machinery at the stern. This arrangement was standard for lake boats until the late 1960s when thousand-foot bulk cargo carriers were introduced. The first iron bulk freighter on the lakes was the propeller *ONOKO* built at Cleveland by the Globe Iron Works in 1882. This 285-ft (87-m), 2,164 gross ton vessel further cemented the basic design pioneered by the *HACKETT* and had a very successful career. The first steel-hulled bulk freighter was the propeller *SPOKANE* built in Cleveland by the Globe Ship Building Company in 1886 (Wright 1969).

Unloading equipment for bulk freighters also advanced in design as the size of vessels increased. Originally bulk cargoes such as coal, iron ore, stone, and grain were unloaded by hand, shoveling cargo into a wheelbarrow, which was then pushed or raised out of the hold. Later, bucket hoists were developed which

were eventually replaced by Hullett steam-powered unloaders. Where the wheelbarrow method of the 1860s might allow the unloading a cargo of 100 tons of iron ore in a day, a single Hullett could unload 100 tons of cargo in minutes with ten-ton bites. In the last quarter of the 19th century unloading changed enormously with the widespread use of self-unloading gear—a series of conveyor belts that take cargo from the hold, transfer it to a long boom, and deposit it in a desired location without assistance in just a few hours.

Loading equipment improved as well. By the late 19th century, gravity-fed grain and iron ore loaders used elevators and slides to load cargo into a vessel in a few hours. Coal loaders were developed that could dump one or two railroad gondola cars at a time onto a conveyor belt that then transferred the coal to a waiting vessel (Wright 1969). Major Lake Erie ports were significantly altered to accommodate these new loading and unloading technologies (Ashworth 1986).

Several important organizations were established in the 19th century to watch over the safety of both the recreational and commercial interests on the lakes. One of the best known is the U.S. Lighthouse Service. The first U.S. lighthouse appeared on the Great Lakes at Erie, Pennsylvania in 1818 and by 1866, there were 72 American lighthouses on the Great Lakes (Hyde 1986). Lights helped prevent accidents, but the federal government soon realized the necessity of providing men and equipment to help reduce the number of lives lost from sailing mishaps. In 1876 the U.S. Life Saving Service was founded. The many feats of bravery of Life Saving crews are legendary. The Service was incorporated into the U.S. Coast Guard in the first decade of the 20th century. Maritime accidents were frequent in the 19th century. Wrecking crews were hired by the vessel captains, owners, or insurance underwriters to either retrieve a stranded or sunk vessel, or when this proved impossible, to remove any valuable cargo or equipment that would help defray losses (Glick and Martin 1998).

The Great Lakes had become well established as a tourist area as early as the 1840s and every summer became the playground for wealthy easterners. Touring the lakes by steamboat was very fashionable, with trips from Lake Erie ports to Detroit, Mackinaw, and Sault Ste. Marie being a primary objective. Other forms of recreation also evolved. Summer sports such as yachting, canoeing, sport fishing, swimming, picnicking, hunting, and boating excursions of all kinds became fashionable by the early 1870s. At the same time winter sports like ice skating, ice boating, and hockey also became prevalent. A whole series of new industries developed to meet these recreational needs. Boat liveries and bathhouses appeared, and even whole lakeshore entertainment pavilions were built by late in the century. Many ports and beach areas became vacation havens to city and inland dwellers. Boat builders began to produce smaller vessels for commercial fishing and recreation.

20TH CENTURY

During World Wars I and II many Great Lakes boat yards also constructed Navy, Coast Guard, and Army vessels for use in combat and supply. Between the wars, ratification of the 18th Amendment to the U.S. Constitution in 1919 brought a different kind of excitement as virtually every port along the border between the United States and Canada harbored smugglers intent upon supplying the desires of the drinking public. The U.S. Coast Guard, Federal Bureau of Investigation, and local law enforcement agencies worked to cut the flow of illegal liquor into the country. Until the repeal of the 18th Amendment in 1933, fast patrol boats sought to capture smuggling craft, the result frequently involving the loss of many small craft in the effort to dodge pursuers in bad weather (Glick and Martin 1998).

The opening of the St. Lawrence Seaway in 1959 provided the first deep water (26 ft or 8 m) direct access of saltwater vessels to the Great Lakes. This increased foreign trade was economically beneficial, but created some new problems for the lakes. The crews of foreign vessels were not familiar with lake conditions and rules of navigation. Local pilots assisted, but were not always successful in helping to avoid accidents such as befell the West German motor vessel *NORDMEER* in 1966 (Barry 1994). A further result of this improved access was the transport of exotic organisms to the lakes. While the alewife and sea lamprey found their way into the lakes through the various Canadian canal locks, the zebra mussel rode into the lakes in the ballast water of ocean going vessels (Beeton 1965, Leach 1992, McCullough 2000).

During the first half of the 20th century passenger boats continued to ply the lakes on regularly scheduled inter-port package freight and passenger service, as

well as for vacation cruises. Lines like the Detroit and Cleveland Navigation Company and the Cleveland and Buffalo Navigation Company became familiar on Lake Erie. However, by the 1960s passenger service on the lakes had been greatly diminished by increasing government regulation, by the deteriorating aesthetics caused by industrialization, and by the development of an extensive interstate highway system (Glick and Martin 1998). Thereafter the primary passenger trade remained as small boat excursions, ferry service, and the cross-lake car ferries, until recent years when the passenger trade was revived as tourist excursions from several lake ports. Today a variety of maritime activities continue on the Great Lakes. Commercial shipping, limited passenger service, and some commercial fishing, as well as recreational boating, fishing, and diving, are all integral parts of the Great Lakes scene.

FISHING INDUSTRY

At least 138 species of fish have been reported for Lake Erie, largely in response to the diversity of habitats and water conditions found in the lake (Regier and Hartman 1973, Herdendorf 1983). In the 18th and 19th century the Lake Erie fishery contained many preferred food and game species, including: largemouth and smallmouth bass, muskellunge, northern pike, and channel catfish inshore, and lake herring, blue pike, lake whitefish, lake sturgeon, walleye, yellow perch, freshwater drum, and white bass in the open lake. Lake Erie has the reputation of containing the world's largest freshwater fishery (Burns 1985). Despite early European settlement, as late as the end of the 18th century the land surrounding the lake was covered with large stands of timber, interspersed with vast prairies and large marshes, particularly along coastal embayments. Because of the dense vegetation cover, soil erosion was limited and runoff waters were generally clean. Stream bottoms were free of clayey silt and protected shallow bays supported luxuriant aquatic vegetation. However, by the late 1800s increased population, industrialization, and urban growth resulted in the clearing of woodlands, burning of prairies, and draining of wetlands for rich farmlands. As a result, exposed soil washed into streams and inshore waters of the lake, covering valuable spawning grounds of many fish species. Beds of aquatic plants, important spawning and nursery grounds for other species, also declined in the embayments as water turbidity increased and nearly all of the coastal swamps were drained during this period destroying more fish habitat. Nutrient enrichment from agricultural fertilizers and household detergents led to "cultural eutrophication" with such consequences as excessive algal growth which settled to the bottom waters to decay and cause severe dissolved oxygen depletion (Beeton 1965). These factors, coupled with intense commercial fishing pressures, caused the collapse of several important fish stocks during the 20th century.

The first commercial fishing in Lake Erie is thought to have begun in 1795 with a hook and line fishery at Presque Isle, Pennsylvania (Leach and Nepsey 1976). By the early decades of the 19th century there was a regular commercial fishery situated at the western end of the lake, centered at the mouths of the Maumee and Detroit Rivers and on Sandusky Bay. Around 1815 seining for lake whitefish, sauger, walleye, and smallmouth bass was well established in Maumee Bay. By 1840 Sandusky, Ohio was the main commercial fishing center on the lake (Thompson 1978). As the fishery grew on the south shore, other villages such as Vermilion, Lorain, and Ashtabula, Ohio became engaged in commercial fishing. By the mid-19th century seining had peaked and was being gradually replaced with pound-nets and gill-nets. The first pound-nets (Figure 3-13) were set in the islands region of western Lake Erie in the 1850s (Langlois 1954) while the first commercially set gill-nets were introduced into eastern Lake Erie in 1852 (Leach and Nepsey 1976). The current NOAA recreational navigation chart of the Islands Area of western Lake Erie (No. 14842) still indicates the locations of submerged pound-net stakes in the North Bay of Kelleys Island (Figure 1-1). A trot-line fishery for bullheads and channel catfish was commenced around 1850 in Ohio waters. Other gear used on the American side included trap-nets and fyke-nets, becoming popular in the late 1800s. From 1820 to 1900 the American catch increased at an average of nearly 20% per year (Thompson 1978). By 1930 commercial fishing methods in American waters were much like the present, with gill-netting prevailing in the eastern and central basins and trap-netting and shore seining dominant in the western basin of Lake Erie (Lloyd and Mullen 1990).

Kelleys Island Fishery. Commercial fishing has long been a pursuit conducted from Kelleys Island. The first pound-nets were brought to the island from Connecticuit and set out in North Bay in 1852

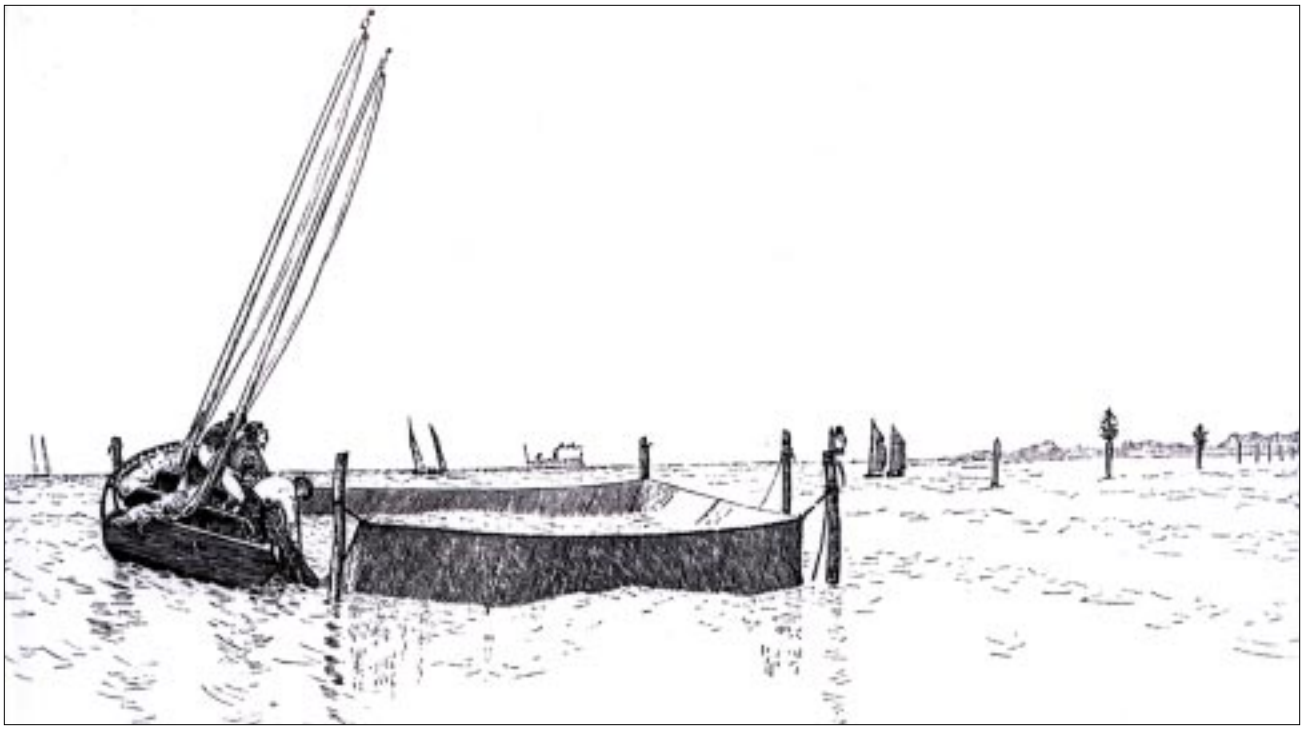

Figure 3-13. Mackinaw-style fishing boat used at Kelleys Island in the 1880s, shown lifting the pod of a pound-net off North Bay, Kelleys Island, Ohio (Godde 1887).

(Carpenter 1877:135). After this pound-netting increased rapidly and large amounts of lake whitefish (*Coregonus clupeaformis*) were caught. By 1858, 57 pound-netters operated out of Kelleys Island, but by 1876 there were only 3 due to the declining population of this species. From the end of the Civil War to the late 1870s, fish populations of all species declined drastically for a variety of reasons—overfishing was later shown to be the most dominant (Wright 1955). Different species rose to market promimence as others wained. As conditions changed, lake whitefish, cisco or lake herring (*Coregonus artedii*), and sturgeon (*Acipenser fulvescens*) were replaced by yellow perch (*Perca flavescens*), carp (*Cyprinus carpio*), freshwater drum (*Aplodinotus grunniens*), and walleye (*Sander vitreus*), the later being considered most desirable for commercial purposes. Walleye was the species island fishermen counted on to earn their living in the 1940s and 50s after the quarries closed.

In 1946, the landing of fish at the island totaled 1,620,700 lbs (735,150 kg), the 4th in importance among Ohio ports. At that time 12 trap-net boats and 5 gill-net tugs operated from the island (Morrison 1950:117). The fishery consisted of spring harvests of primarily walleye, with the most productive fishing grounds being off the northwest shore. This was also the season for netting channel catfish (*Ictalurus punctatus*) in North Bay. In summer the catch was poorest as the fish avoided the warm, shallow inshore and shoal waters; the most important species in this season was yellow perch and blue pike (*Stizostedion vitreum glaucum*). During the fall months fishing improved and lake whitefish were the most sought-after species.

Once the North Bay quarry was abandoned (ca. 1940), the quarrylands were used by commercial fishermen as a place to dry and tar their nets (Figure 3-14). The largest fish enterprise, Lay Brothers Fish Company, also reused KIL&T Co.'s former company store as a twine house until the building was demolished in the mid-1960s (Myers et al. 1992:24,25). Because Kelleys Island was strategically located between the fishing grounds and the mainland markets, Lay Brothers chose to base its fishing fleet on the island and eliminate several hours of ship time. They used a single large vessel to transport the catch to Sandusky or Cleveland. In the mid-1950s the staple of the walleye diet, mayfly larvae, fell victim to increasing levels of pollution in the lake (Britt 1955). As a consequence Lay Brothers Fish Company interests on the island

were abandoned. To fill the void left by its departure, the Kelleys Island Fisherman's Co-op was organized. However, the fish populations, and hence the economy, remained depressed and many fisherman families left the island (Pape 1988). In the 1950 census, half of the adult males on the island (45 individuals) reported fishing as their occupation, but by 1965 the commercial fishery had collapsed. Overfishing, pollution, and a shift in regulations to favor sport fishing over commercial fishing eventually brought an end to commercial fishing on the island.

Evolution of Great Lakes Vessels

Great Lakes ships did not evolve in a vacuum, although they developed in an environment somewhat isolated from oceanic shipping. Lakes craft took on distinctive characteristics while employing much the same technology that was utilized in other great maritime nations. Most of the general patterns of vessel design were developed in England, Scotland, and France, and soon afterward adopted on the Great Lakes; some features were also borrowed from America's great rivers, such as the Hudson and the Mississippi (Labadie 1998).

Earliest Ships. Most of the first ships on the Great Lakes were military craft built by the French, the British, or the Americans, between 1750 and 1814. Each of these three nations had relatively large naval forces at one time or another, principally centered on Lake Ontario. Some of these craft were tailored to Great Lakes conditions, but most were square-rigged brigs and barks similar to contemporary naval craft on the high seas.

There was limited merchant shipping on the Great Lakes in the last decades of the 18th century, but privately-owned vessels began to emerge following the War of 1812. Scores of merchant sailing craft were built on Lakes Ontario and Erie by 1820, and their numbers swelled during the prosperous decades that followed. Early hull forms had their roots in the fighting fleets, including the persistence of an exaggerated deadrise (deep-V shape). Many different sail rigs and configurations were introduced by builders from various countries and shipbuilding traditions, but by 1820, the lake schooner had clearly emerged as the most suitable rig for the lakes, particularly in the merchant trades (Labadie 1998).

Figure 3-14. Commercial fishing operation at North dock on Kelleys Island following the abandonment of North Bay quarry, ca. 1942 (courtesy Cleveland Museum of Natural History).

Lake Schooners. Schooner-rigged ships (Figure 3-15) were easier and cheaper to build and to man than square-rigged barks and brigs. They also proved more maneuverable in the confined waters of Lake Erie. The first merchant schooners on the lakes measured from 50 to 80 ft (15 to 25 m) in length and carried little more than 100 tons of cargo. Their dimensions were limited principally by the depth of channels and the poor condition of most harbors. Bottlenecks like the shallow Detroit and St. Clair Rivers or the shoals in most of the ports, prevented large ships from navigating safely. When larger craft were built, they suffered costly delays from frequent groundings. In some places, cargoes had to be off loaded onto barges and then laboriously reloaded after the ship had passed over the shoals. As a result schooners were built very shallow.

Generally, lake schooners were single-decked vessels built principally of oak, with one or two very heavy longitudinal timbers forming the keel, stout "built-up" transverse frames, and double skins of inner and outer planking. The masts were stepped into the keels. Decks were supported with transverse deck beams resting on "shelves," often reinforced by "hanging knees" (wooden brackets of tough tamarack or oak). Shipwrights in the lower lakes used a heavy shelf, triangular in cross-section, which combined the functions of shelf and knee. The basic hull configuration persisted until the middle of the 19th century (Labadie 1998).

The completion of the Erie Canal in 1825 brought enormous numbers of immigrants into the region during the next several decades as well as an economic boom. The surge of settlement and growth in the 1820s and 1830s generated shipbuilding activity, and a fleet of several hundred ships resulted. Prosperity not only brought more ships, but it also brought improvements to the harbors and connecting channels, which resulted in larger, more efficient ships. Completion of the Welland Ship Canal in 1829, between Lakes Ontario and Erie, strengthened the boom and reinforced the Canadian fleets as the Erie Canal had so effectively favored the American ones. The Welland Canal opened

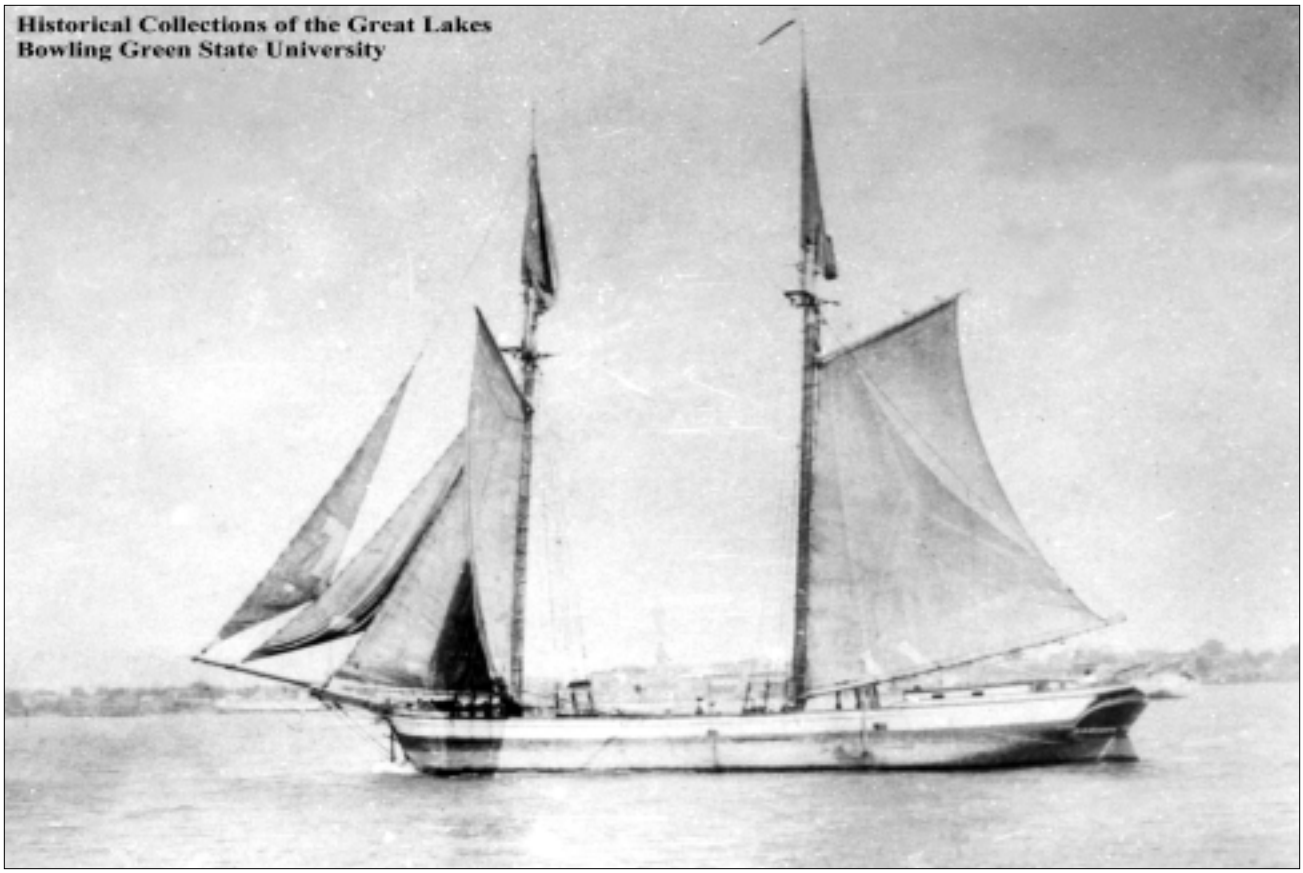

Figure 3-15. The schooner H. D. ROOT*, built in Lorain, Ohio 1863 (courtesy Bowling Green State University, Historical Collections of the Great Lakes).*

the St. Lawrence River to Great Lakes ships and eventually enabled upper lakes craft to navigate the oceans of the World. Canadian craft passed successfully down the St. Lawrence in 1846 and began trading to Liverpool and Hamburg in the 1850s. American schooners from Cleveland, Lorain, Sandusky, and Detroit began trading overseas by the end of the decade using the Welland and St. Lawrence River canals.

The canals, especially the Welland, had profound and lasting effects on the design and dimensions of Great Lakes craft. Since a large part of the Canadian fleet was based on Lake Ontario, it had to pass through the Welland Canal to navigate the upper lakes. "Canallers" were built with boxy hulls nearly duplicating the dimensions of the lock chambers, in order to carry the greatest possible cargoes and still fit through the locks. The "First Welland" Canal had 100-ft (30-m) locks, large enough to accommodate most of the Great Lakes fleet of the 1830s. The canal was enlarged in 1845, with 150-ft (45-m) locks; "Second Welland" canallers were 145-ft (44-m) vessels which were built in great numbers between 1845 and 1880, including both schooners and steam vessels. A very large number of Lake Erie shipwrecks are from these classes. When the "Third Welland" was built in the 1880s, it had 250-ft (76-m) locks, and so, not surprisingly, a whole new class of 245-ft (75-m) ships appeared; since the sailing craft were now superseded by propeller steamers, all of the new canallers were steam-powered vessels. A "Fourth Welland" Canal was opened in 1958, and today's 730-ft (223-m) "Seaway" class vessels were developed to fit its locks (Jackson 1988).

Centerboards were introduced in Great Lakes sailing craft in the 1820s. They were almost universally adopted by 1840 because they enabled schooners to sail well in spite of their unusually shallow hulls. Centerboards kept a sailing vessel from being driven to leeward (sideways) by a beam wind (Barkhausen 1990). Wire rigging, introduced around 1860, was also an important improvement to sailing ships; it replaced the more traditional hemp shrouds which stretched and required constant adjustment (older rope rigging is the hallmark of pre-Civil War ships). Both hemp-rigged and wire-rigged ships used wooden deadeyes to set up their shrouds, although some of the last schooners and schooner-barges used rigging screws (turnbuckles) during the 1880s and 1890s. New designs for iron winches, windlasses, steering apparatus, pumps, and ground tackle (anchors) helped make possible larger, safer, and more efficient sailing ships starting in the 1850s.

Schooners 100-ft (30-m) long were rare before 1840, but afterwards they were built larger and larger until canal-sized 145-ft (44-m) were the norm in 1850. These vessels carried payloads of up to 350 tons. Wooden ships built longer than 100 ft (30 m) had backbones fashioned of several heavy oak timbers or "keelsons," each measuring 10 to 14 in (25 to 35 cm) square, running the entire length of the ship. In most other respects, they were framed and constructed much like earlier schooners. Brigantines enjoyed a period of popularity in the late 1840s, probably because they were fast enough to compete favorably with schooners in the long runs from Buffalo to Lake Michigan grain ports in a very competitive era; nearly 100 so-called "brigs" were built between 1846 and 1849. Barkentines were similarly popular around 1860, but the advantages they offered in speed were soon outweighed by the extra costs of larger crews. Principal rigs used on the Great Lakes were sloops, schooners, brigantines, and barkantines. A sloop was a sailing craft with one mast. A schooner had two or more masts, all-fore-and-aft rigged. A brigantine had two masts, the forward being square-rigged and the main (second) fore-and-aft rigged. A barkentine had three masts, with the forward one square-rigged and the main and mizzen fore-and-aft rigged (Labadie 1998).

Many three-masted schooners in the 160-ft (50 m) range, and averaging about 600 gross tons, were constructed in the 1860s to haul upper lakes grain and lumber. After 1870, when the St. Clair Flats shoals were cut with a new ship canal, nearly two hundred 200-ft (60 m) schooners were built for the grain and iron ore trades. They were the ultimate development in Great Lakes schooners. These great sailing ships were all three-masters with long bowsprits and jibbooms, gaff-topsails, and triangular "raffees" atop their foremasts. Because of their large dimensions, they were fitted with multiple keelsons, with vertical hold stanchions running down the centerline to support the deck beams, and often with hold beams (horizontal timbers fitted athwartships halfway between the deckline and the bottom) to stiffen their oaken hulls (Labadie 1998).

The early 1870s was the heyday of sailing craft on the Great Lakes; at that time there were nearly 2,000 such vessels. Two- and three-masted schooners were

by far the most numerous sailing craft, but there were also several four-masted schooners and one five-master, plus sloops, scow-schooners, barks, brigs, and unrigged barges. However, most of the sailing craft built after 1874 were tow-barges, rigged with stubby bowsprits and shortened masts intended to be towed behind large steam freighters. Some tow-barges built in the 1890s were over 300 ft (90 m) long. During the 1880s and 1890s most of the sailing vessels were reduced to tow-barges, and by 1910 real sailing craft were a rarity. By the time of the Great Depression in 1929 there were only two or three sailing ships left; most of the proud old schooners, which had long since been cut down to barges, were abandoned and rotting away in the "boneyards" of various ports (Wendt 1984).

Lake Scow Schooners. A scow is a vessel with flat bottom, vertical sides, and a "hard chine" or square bilge. More conventional sailing ships the world over had rounded bottoms and sides with a relatively gentle curve at the bilge where bottom and side came together. In general, the rounder the bilge, the stronger the vessel's hull. The simple scow hull-type appears to have been in use before the medieval period in the shallow rivers and estuaries of Western Europe. Their sturdy shallow-draft hulls made scows particularly suitable for ferries. Although the earliest of these vessels seem to have been rowed, sculled, pole-driven, or pulled by ropes, some 17th-century Dutch engravings show sail-driven scow ferries as well, fitted with a single spritsail (DeGroot and Vorstman 1980:181,200). Interestingly, in these craft the mast was stood at the vessel's side so that wagons and carriages could be loaded on deck without the obstruction posed by a mast on the centerline. The literature seems to apply to these vessels the name "pont" or "ponter," undoubtedly the root for the modern term "punt," which refers to a small, square-built duck-boat. British historian John Leather attributes the origin of the general scow pattern to the old Dutch *schouw*, "a swim-ended craft with bow and stern transoms, really a large form of pram." (Leather 1984:221). The British used many different scow-type vessels in the 17th and 18th centuries, all of which were classified as barge types (Carr 1936:15,16).

How or when scows were introduced to the New World is unknown, but most likely the tradition was brought by Dutch or English colonists very early in the history of this country. Scows were tailor-made for large estuaries like the Chesapeake, the Hudson, the Delaware or the innumerable smaller tributaries reaching inland from the Atlantic. Historian Howard I. Chapelle 1951:32-33,45) describes many varieties of flat-bottomed watercraft in use in American waters in the 18th and 19th centuries, including several different sailing scows. Newell (1996:9) studied numerous "flatboat" designs used in the Southeast, and concluded that the general type was probably brought to America by the English, who used it to colonize the seaboard; "flat-bottomed pull boats" employed in the (American) colonies as early as 1638. Newell also describes a primitive variety of small cross-planked scows which he calls "chine-girder boats" and attributes their development to the very old split log tradition, where the sides of a boat were fashioned from two halves of a split log, and transverse bottom planks were attached between them to gain sufficient width for carrying cargo.

Commercial navigation came to the Great Lakes ostensibly following the War of 1812 when the British relinquished their tight control over the region and American entrepreneurs began building ships for competitive trade. The vessel of choice for the next decades was the two-masted schooner. By 1820, there were dozens of them operating on Lakes Ontario and Erie, and ten years later their numbers had multiplied several fold. At the height of the sailing ship era in 1870, there were nearly 2,000 schooners on the Great Lakes, including several varieties of sailing scows.

U.S. government enrollment records, refer to scow schooners operating on Lake Ontario and the Finger Lakes of New York as early as the mid-1820s. Twenty years later they were in use all over the Great Lakes and in Lake Champlain. Several hundred scow schooners were eventually built on the Great Lakes, and others were constructed on the Gulf Coast, in California, and eventually in Australia and New Zealand. Olmsted (1988:24) reports that 400 scow schooners were on San Francisco Bay by 1900. At least six hundred have been documented on the Great Lakes using official U.S. Customs Department enrollments; other sources are not nearly as reliable, but suggest that their numbers may have been still greater. Some records describe schooners with "scow bottom" or "scow stern," for instance, and it is impossible to ascertain whether or not such craft were really scows by the definition given above. Also 19th century journalists were particularly casual about their use of

sailing craft terminology. The heyday of scow schooners must have been around 1885, although some of these quaint vessels survived well into the 20th century.

In spite of their general longevity and profitability, scows were never ranked by the shipping industry with their more conventional sisters. A key measure of their acceptance was their insurance rating as determined by underwriters. Vessels constructed according to a strict code of standards, known as "underwriters' rules," were rated A1, A2, B1, B2, C1 and C2 or, worst of all, "not insurable." The higher the rating, the lower the insurance premiums for a given vessel. The Board of Lake Underwriters adopted a rule in 1866 saying that:

> "Frame-built scows, well-constructed and of good material, with fore and aft bottom plank, may be entitled to class B1 [for] five years, but in no case will scows be entitled to the B1 grade if built with gunwale sides or athwartships [cross-planked] bottom." (Board of Lake Underwriters 1866:14)

Scow schooners seem to have been most numerous in the Bay of Quinte and eastern Lake Ontario, in western Lake Erie, and around Lake St. Clair and the Detroit and St. Clair Rivers, although they were found from the St. Lawrence River all the way to Duluth. Insight into the operation of a typical Great Lakes scow may be found in the *Diary of Soren Kristiansen*, published by the Delta County Historical Society Foundation (1981). The principal criterion for their construction and practical use was undoubtedly shallow water, but they were also very economical. Scows could be built with little money and limited skills, and they could be managed safely by crews smaller than conventional sailing craft (Inches and Partlow1964:291). There were many variants of scow hulls, with square ("butt-end"), pointed ("flat-iron"), round ("spoonbill" or "swim-headed"), or barrel-shaped ends (Barkhausen 1947:13-14). Most scows were built with conventional transverse frames and longitudinal planking, although some had either diagonal or cross-planking, both of which would have required a specialized and non-traditional framing scheme (Greenhill 1988:126-157). "Gunwale-built" scows had thick sides that provided the requisite longitudinal strength to their hulls, and they could forego the conventional longitudinal planking in their bottoms and utilize simple cross-planking instead (Inches and Partlow 1964:290, Leather 1984:222). Some scows had internal bulkheads running longitudinally, which served the same purpose as the thick gunwales (Hawkins 1987:24-28). Scow rigs were as varied as were their hulls. There were sloops, two- and three-masted schooners (with and without topmasts), scow brigs, brigantines, and barkantines. Most scows used one, two, or three headsails (jibs), and all seem to have been provided with conventional bowsprits for that purpose. Many carried one or two gaff-topsails, although some were "bald-headed" with no topsails at all. Some scows used triangular "raffees" on their foremasts, and a handful, especially in the 1840s to 1860s, used old-fashioned square topsails. Almost all were fitted up with centerboards.

In spite of their unsophisticated hull forms, scow schooners were generally regarded as good sailers (Chapelle 1951:50, Olmsted 1988:19). In March, 1860, the scow *GRANGER* made two trips from Detroit to Kelleys Island for stone within six days in spite of an accidental sinking in the meantime, having been raised the next day (*Detroit Free Press*, March 31, 1860). The *SENATOR* made 24 round trips from Port Huron, Michigan to Ohio ports during 1870, handling 36 cargoes in a 225-day season (*Port Huron Daily Times*, December 23, 1870). In the 1870s an unnamed scow reportedly outran a fleet of sailing yachts during a much-publicized race from Detroit to Put-in-Bay, when westerly wind conditions were optimal. Scows were also sturdy vessels, capable of sailing in heavy weather and surviving frequent groundings. An 1874 article refers to the 98-foot scow *C.C. BUTTS*: "For the twelfth time, the scow *BUTTS* has been rescued from the beach, and after some tinkering, will if possible, eke out a few years more in the coasting trade...she is 29 years old…and has been wrecked on each of the four Lakes." (*Detroit Free Press*, June 20, 1874). The scow schooner *W. R. HANNA*, which wrecked in an 1886 storm off Long Point of Kelleys Island, is an example of this class of vessels.

Sidewheel Steamboats. Steamboats propelled by sidewheels were introduced to the Great Lakes with the construction of the *FRONTENAC* near Kingston, Ontario in 1816 and the smaller *WALK-IN-THE-WATER* at Black Rock, New York two years later. Steamers had some obvious advantages over conventional sailing craft, but they were also extremely costly to build, and so they were used at first only to carry passengers. With the enormous tide of

immigration to the region in the 1830s through the 1850s, there was a tremendous demand for steamboats—19 were built during the 1820s, 129 in the 1830s, 130 in the 1840s, and 134 in the 1850s (Herdendorf and Schuessler 1993). The sidewheel steamer *ST. LOUIS* (Figure 3-16), built in 1844, wrecked in an 1852 storm on Kelleys Island Shoal, about 2 mi (3 km) northeast of Long Point.

The first steamers had simple schooner-like hulls, where the machinery was introduced almost as auxiliary power. Steamboat design became more sophisticated during the 1830s, and larger, stronger hulls were built to support heavy boilers and engines and spacious passenger cabins. In 1838 the paddle-wheeler *GREAT WESTERN* introduced upper deck cabins. Between 1830 and 1850 the average size of Great Lakes steamboats went from 180 to 550 tons, and the length from 100 to 185 ft (30 to 55 m). Unfortunately harbors and channels were so shallow that steamboats, like schooners of the period, had to be constructed shallow, making them limber and structurally weak. To cope with this problem, chain trusses and huge wooden arches were built into the sides of the frail hulls to stiffen them and to spread out the concentrated stresses created by weighty machinery. Heavy "side keelsons" were laid in the hulls on either side of the centerline keelsons to add longitudinal stiffness. Until iron and steel hulls were introduced in the 1860s and 1870s, the complicated array of chains, rods, samson-posts, arches, and keelsons became an essential part of the fabric of large steam vessels (Labadie 1998). These features are often identifiable in Lake Erie steamboat wrecks.

In 1844, the giant, 265-ft (80-m) *EMPIRE* was built at Cleveland, Ohio. She was the first 1,000-ton steamer in the United States, and the first of what came to be known as the "Palace Steamers." Between 1844 and 1857 there were about 25 exceptionally large sidewheelers built on the lakes, principally for the runs between Buffalo, Detroit, and Chicago; most were operated by railroad companies. The era of these steamers was brought to a premature close by the depression in the mid-1850s, but the lavish ships were the finest the Great Lakes have ever known. A few of these elegant steamers were lost in their prime, including the wrecks of the *ATLANTIC* and *MORNING STAR* in Lake Erie.

The Civil War ended the financial panic of 1857, and with the economy restored, commerce resumed. Shipyards began to turn out more steamboats, but never again quite so grand as those of the early 1850s. In the late 1860s and through the 1870s, many large and elegant craft were constructed for Lake Ontario, St. Lawrence River, Lake Erie and Lake Michigan fleets. Unlike the "Palace Steamers," most of the post-war paddle-wheelers were powerfully-built, with heavy side keelsons in their hulls and monolithic "crown-arches" at their sides. They did not employ the more

Figure 3-16. Sidewheel steamer ST. LOUIS, *built at Perrysburg, Ohio in 1844 (Erik Heyl Collection).*

complex systems of rods, chains, tie-bars and arches-within-arches as in the earlier boats (Labadie 1998).

Iron hulls became popular in steamboat construction in the 1860s in Canada, and around 1880 in the United States. Relatively few sidewheelers were built after 1880, since screw steamers now dominated the passenger and freight routes; almost all of those built after this time were of steel construction. These craft used box-girders and I-beams for keelsons, angle-bars for transverse frames, and thin steel plates for their shells; most had double-bottoms for water-ballast, but they were all single-skinned in the sides. Superstructures were generally built of wood, although the lower decks and cabins of some were framed in steel.

Propeller Steamers. In the early 1840s Lake Ontario shipyards experimented with small steamers built with the new screw propellers recently introduced by Swedish inventor John Ericsson. Screw steamers worked well in the Canadian canals, where paddlewheel steamers had proven too beamy. The new craft, called "propellers," were an immediate success and they soon revolutionized the canal trades. They could carry cargoes roughly comparable to schooners of the day, were not dependent on the wind, and cost a fraction of what sidewheelers did to construct and operate. They could also navigate the canals without being towed. Some of the earliest screw steamers were not cargo carriers, but were towing tugs (Nielson 1987).

The first propellers had simple, single-decked schooner-like hulls with compact machinery fitted into their sterns. They were frequently fitted with one or two masts and were schooner-rigged. Many of the first propellers were canal-sized, being 100 ft (30 m) long before 1845, and 150 ft (45 m) after that date. During the 1850s, many larger propellers were built for the upper lakes; not having to navigate the Welland Canal, some were 160 to 180 ft (50 to 55 m) long, with correspondingly greater beam and depth. Most of these large craft carried package freight from Buffalo to the developing communities on Lake Michigan, and pork, beef, flour, or grain "downbound." Their cargo capacities averaged about 900 tons.

The large propellers of the 1850s and 1860s used the same methods for stiffening their wooden hulls as did the sidewheelers of the day. They had several heavy longitudinal side-keelsons laid over the frames in their bottoms and great crown-arches built into their sides to prevent twisting or sagging (hogging). These vessels all had big openings or "gangways" in their sides for loading their freight cargoes. Many also had passenger cabins on their upper decks. Between 1845 and 1855 the average tonnage of these craft went from 330 to 600. Some 76 propellers were built in the 1840s, and 214 more were built during the 1850s (Herdendorf and Schuessler 1993), most before the serious financial woes of late 1850s. The 1857 depression caused a suspension in shipbuilding, and the next surge of propeller construction did not come until 1870, when some 30 specialized "package freight" propellers were built, all without passenger cabins. The *F. H. PRINCE*, built in 1890 as a package steamer of this class, ran aground and burned off the east shore of Kelleys Island in 1911 (Figures 3-17 and 3-18).

Steambarges. The first bulk freight vessels were small screw steamers designed to carry lumber and tow several barges behind. Known as "steambarges," they differed from conventional propellers by carrying much of their cargo on deck. They were single-decked vessels with schooner-like wood hulls and a small house aft for boiler, engine, and crew. Steambarges were introduced in the late 1860s along the St. Clair River, where much of the lumber industry was centered at the time. By the end of the decade there were 45 steambarges in use and about 150 more were built during the 1870s. Hundreds of sailing ships were relegated to the role of tow-barges after initiation of the consort system and the invention of steambarges.

Forced to be innovative during the depression of the late 1850s, Buffalo shippers found a way to make a profit on low-value, high-volume commodities such as lumber products. Retired passenger steamers were dismantled, made into barges, piled high with pine lumber, and towed to "downlake" markets. The huge barges carried far more than the steamers or schooners of that era, and they could be towed two or three at a time by tugs or steamers. This was the birth of the "consort system," which revolutionized the carriage of bulk cargoes. This important change led directly to the development of bulk freighters (Labadie 1998). The *TRADER*, built at Marine City, Michigan in 1865, is believed to have been the first steambarge.

Steambarges (or "lumber hookers") were single-decked steamships whose basic hull construction differed little from contemporary schooners, except that

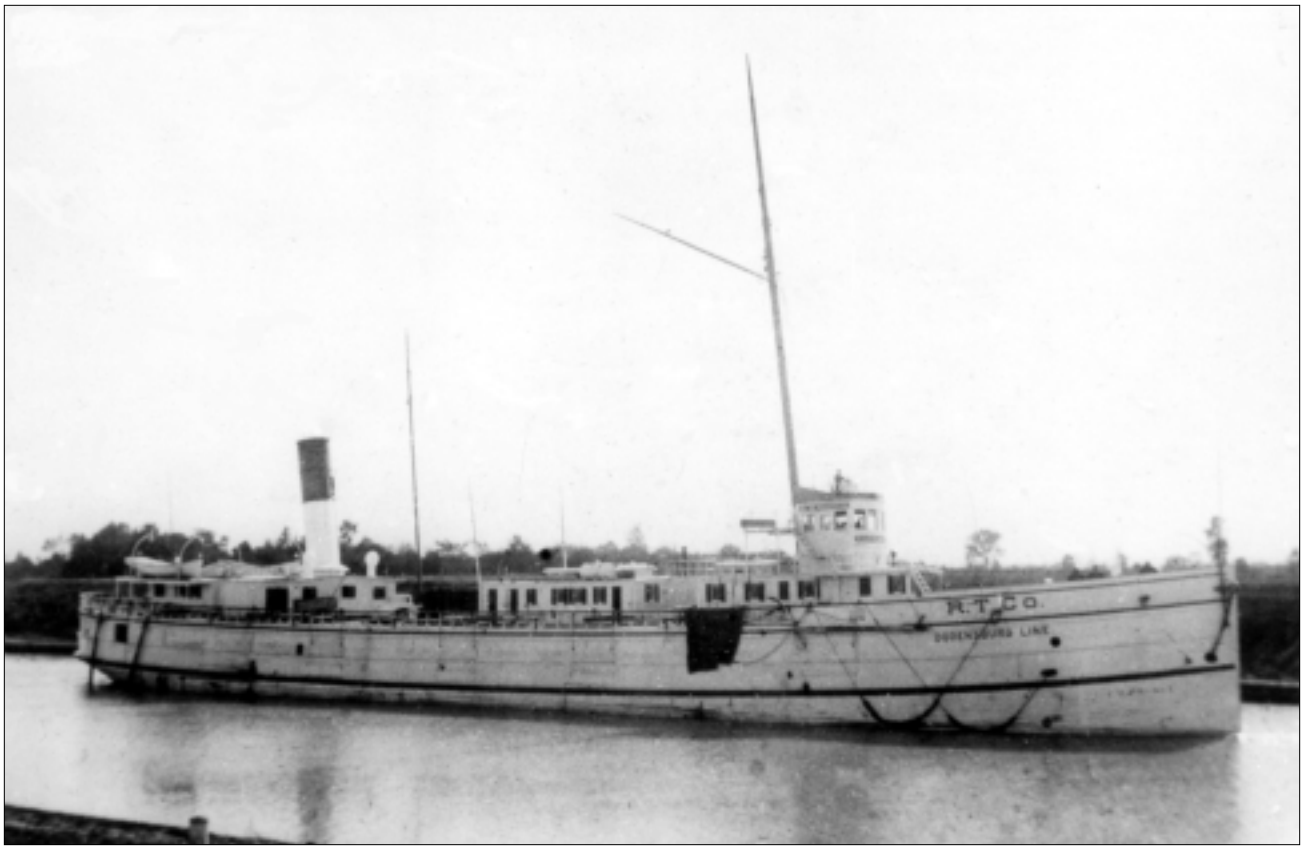

Figure 3-17. Steamer F. H. PRINCE*, ca. 1900 (courtesy Bowling Green State University, Historical Collections of the Great Lakes).*

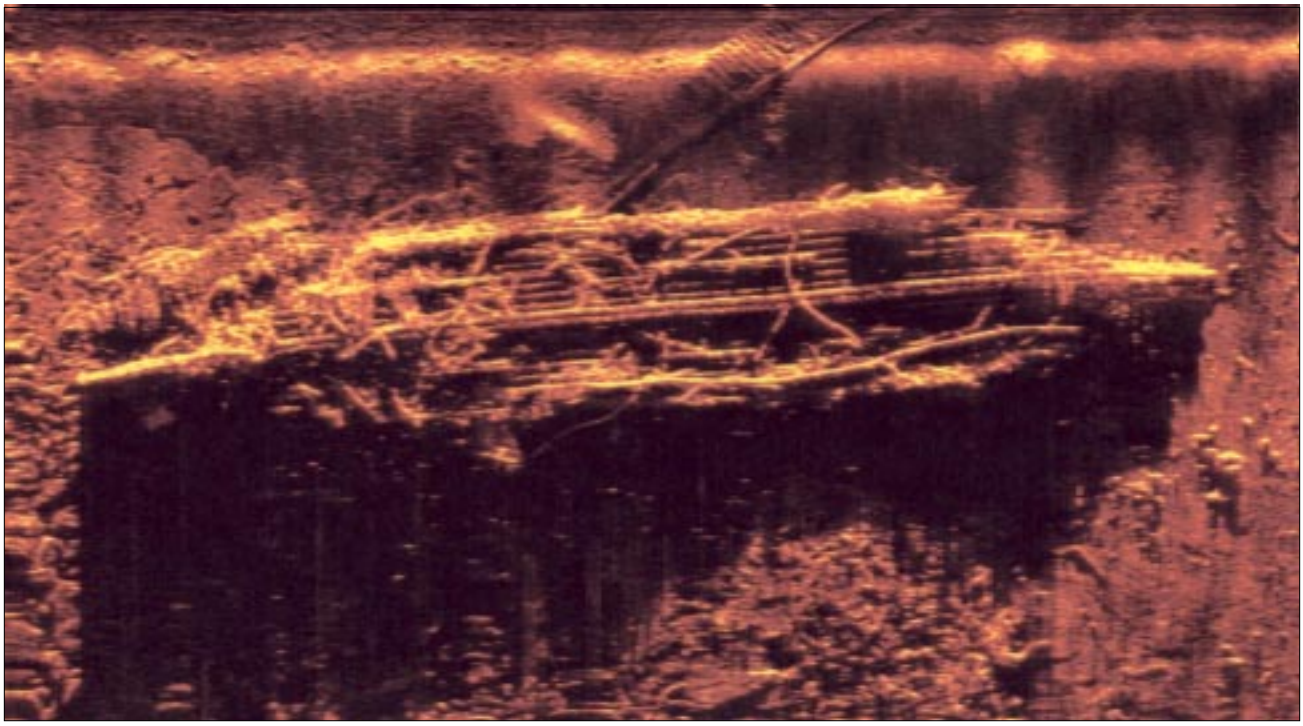

Figure 3-18. Side-scan sonar image of the F. H. PRINCE *wreck off the east shore of Kelleys Island (courtesy Greg Millinger, 1999).*

they were self-propelled, with boilers and engines, and had cabin accommodations necessary for larger crews. The earliest steambarges had their cabins aft, although the larger steambarges which evolved after 1880 often had pilothouse and some of their cabins on a raised forecastle at the bow; this feature was advantageous in larger craft since it improved visibility for the master and wheelsman. Most vessels of this type ranged between 90 and 175 ft (27 to 53 m) in length with capacities from 150,000 to about 1,000,000 board ft (800 tons) of lumber. Between 1865 and 1910 there were 800 steambarges built on the Great Lakes (Labadie 1982), and the type was adopted in the Pacific Northwest when the lumber industry moved there at the turn of the century. On the West Coast, the vessels were referred to as "steam schooners."

These sturdy vessels carried their cargoes on deck as well as below, but because their below-decks capacity was limited, they were particularly suited for products that could be exposed to the weather and piled high on deck. These products included lumber, coal, sand, stone, or barreled salt. Steambarges were also good money-makers because they had the horsepower to tow two, three, or more loaded barges behind, multiplying their payloads several fold on any given trip. Some of the more powerful "hookers" routinely towed six barges back and forth between Saginaw, Michigan and Toledo, Ohio or Buffalo, New York during the 1870s and 1880s.

Steambarges proved essential to the development of the lumber industry on the Great Lakes and to the cheap transportation of forest products. Moreover, they were the prototypes for the Great Lakes' unique "bulk freighters" which soon followed them in the grain and iron ore trades and persist to the present day with little change (Labadie and Murphy 1987:57-60). The steambarge *ADVENTURE*, a converted schooner, burned and sank in North Bay of Kelleys Island in 1903. Steambarges disappeared not long after the collapse of the lumber industry in the Great Lakes region around 1920, but their double-decked descendants have served America's economy for more than 130 years by hauling mountains of grain, coal, and iron ore inexpensively. The bulk freighters of the Great Lakes are known the world over for their efficiency and economy, and they are direct descendants of the modest little steambarges like the *ADVENTURE*.

Early Bulk Freighters. The steambarge concept was quickly adopted for grain and iron ore trades, but since ore and grain had to be kept dry they could only carry as much of these cargoes as would fit below decks which severely limited their capacity. Capt. Elihu Peck of Cleveland built the 208-ft (63-m) *ROBERT J. HACKETT* in 1869 with double decks so that she could carry ore or grain entirely below decks. She had deck-hatches spaced at 12 ft (3.7 m) intervals to match the loading spouts on Marquette's ore docks. She had a powerful engine and could tow one or even two fully-loaded barges, just as the smaller steambarges did in the lumber trade. Based on her success, in the next five years, 45 "bulk freighters" were constructed; few were less than 200 ft (60 m) and they averaged 1,200 tons carrying capacity. During the last 20 years of the 19th century, more than 300 wood bulk freighters were built.

Early steambarges were small, 110 to 135 ft (35 to 40 m) in length. By 1880, much larger, more powerful bulk freighters appeared, often 160 ft (50 m) in length. Difficulty in navigating the larger craft from the stern, particularly with a deck cargo piled high amidships, led to putting the pilothouses on a raised forecastle at the bow, which became the pattern for all bulk freighters built after that date. Between 1870 and the turn of the century, there were more than 600 of these vessels built in Great Lakes shipyards (Labadie 1998). Early bulk freighters of the larger size required wooden arches to stiffen their hulls; the later versions employed steel reinforcing with straps and internal arches, which interfered less with handling of cargoes. Many bulk freighters were provided with centerboards, just as schooners were, since they carried sails and were susceptible to leeway drift when the wind was at their sides.

Iron and Steel Freighters. By 1900 few wooden ships were being constructed; steel was the preferred material for building ships' hulls. The last wooden bulk freighters were built 300 ft (90-m) long by using complicated systems of steel reinforcing in their structures. Eventually it proved simpler to construct ships of steel that were more than twice as large, and they were actually cheaper to build than wooden craft. Metal-hulled ships also carried far more payload than wooden ships of the same dimensions, since their hulls were lighter and thinner; a wooden hull was typically 2 ft (60 cm) thick, while an iron or steel one was seldom more than 0.75 in (2 cm) thick. Steel hulls could also be fitted with double-bottoms and water-ballast tanks,

which gave them stability even when they were not loaded, a great advantage over wooden ships.

Iron ships were built in Scotland and England before 1800 and the small iron propeller *ROBERT F. STOCKTON* crossed the Atlantic to serve as a tug on the Delaware & Raritan Canal (Labadie 1998). In 1842 the survey steamer *COL. ALBERT* and the gunboat *USS MICHIGAN* were fabricated of iron plates at Buffalo, New York. Iron was not commonly used for shipbuilding until the 1870s, and it was largely superseded by steel around 1885. The use of metals in shipbuilding grew steadily after that, so that during the 1890s about 65% of the new tonnage was in steel.

In 1882 the iron bulk freighter *ONOKO* was launched at Cleveland, inaugurating a new era for Great Lakes transport. The 287-ft (87-m) craft was a giant for her day, and she quickly proved the suitability of iron for large ships, particularly in operating profitably and efficiently in the grain and iron ore trades. Steel construction began in 1888, and dozens of 300-ft (90-m) vessels were turned out during the next decade. The 387-ft (118-m) *VICTORY* was built in 1894 (largest ship on the Great Lakes at the time), and then several 500-ft (150-m) steel vessels were built just five years later. Vessel dimensions changed rapidly in the early 1900s as enlargements were completed at the Sault Ste. Marie locks and shipbuilding technology improved. The craft constructed during this period served as the backbone of the Great Lakes merchant marine fleet until the 1950s (Wright 1969).

MARITIME HISTORY OF KELLEYS ISLAND

Kelleys Island, Ohio, located in Lake Erie near the port of Sandusky, is an important source for high-quality limestone—quarries dating back to the 1830s. At one time the island was the largest producer of lime products in the world. The island's quarries furnished building stone for coastal construction projects, flux stone for steel mills, burned stone for agricultural use, and many other lime products. All of these stone products were transported from the Island on shipboard.

Until around 1880, most of the stone from Kelleys Island was carried on board Great Lakes schooners varying from little two-masters 50 ft (15 m) in length to deep-draft three-masters 200 ft (60 m) long. Schooners dominated all of the Great Lakes carrying trades from just after the war of 1812 until nearly 1890. During this time the average schooner grew in dimension and tonnage on account of improvements in shipbuilding technology and the general deepening of harbors and channels, but also in response to the burgeoning requirement for the transport of commodities. At the peak of the schooner era in 1871, nearly 2,000 schooners were registered at Great Lakes ports. The number of sailing craft dwindled after that time because of the growing popularity of steam freighters. With a few rare few exceptions, the last schooners disappeared during the 1920s. In general, the ships trading at Kelleys Island reflected the broad patterns of ships employed on the rest of the Lakes, although they were often of the smaller classes because of the necessity to navigate in and out of small unimproved harbors. As early as 1850, many of the craft regularly engaged in the trade were small scow schooners. These rugged little sailing craft were ideally suited for the shallow-draft ports on Lake Erie and Lake Huron; most could be sailed handily by two or three men.

Another class of vessels frequenting Kelleys Island loading docks after the middle 1860s was the steambarge. This was a single-decked wooden steamer of a little more than 100 ft (30 m) in length, built to carry lumber cargoes or bulk products such as salt, stone, coal, or iron ore. The earliest steambarges had their pilothouses and all of their cabins perched on the stern along with boiler and engine spaces. After 1880 larger steambarges appeared, some as much as 200 ft (60 m) in length, and with raised forecastles and pilothouses at the bow. Most of the steambarges in the Kelleys Island stone trade were the smaller variety, seldom exceeding 120 ft (37 m) in length. They were often paired with consort-barges of similar dimension. A typical schooner could be sailed by four to six men, while a steambarge required 12 to 15; a consort-barge on the other hand, required only two or three. The combination of steamer and barge (or barges) could haul several hundred tons of stone products inexpensively, and unlike sailing craft, they were not dependent on favorable winds. KIL&T Co. operated its own fleet of these efficient little steamers from 1872 until they were superseded by more modern craft in the 1940s. Dozens of other owners ran steambarges to the Island's three big docks as well when steam vessels superseded the earlier classes of sail craft. The steambarge *ADVENTURE* was typical of them; her remains were documented at Kelleys Island in 1997 (Labadie and Herdendorf 1998).

The transport of limestone and lime products contributed greatly to the early commercial traffic on the Great Lakes and has traditionally ranked among the top five commodities in shipping tonnage. Initially, much stone, well adapted to building purposes was shipped from Kelleys Island, but in the later years all the limestone was crushed and shipped to Lorain, Cleveland, Buffalo, and Gary for flux, or to Duluth to be burned into lime. In the late 1800s the quarry operators burned lime on the island and shipped it throughout the Great Lakes region until it was found to be more economical to burn stone near the markets or near sources of fuel (Ver Steeg and Yunck 1935:433).

During the decade before and following the turn-of-the-century, North Bay lime kilns produced up to 1,780 barrels of lime per day. The peak of the limestone business on Kelleys Island occurred during this period when mechanization stepped up production, creating a boom. KIL&T Co. grew to be the largest limestone producer in the country and its stone was reputed to be the best (Gilfillan 1959:20). With the construction of the West Bay loading dock in 1910, KIL&T Co. was able to increase its production of stone. For the next decade the Company shipped over half a million tons annually in some 600 lake carriers (Linhardt 1995:35). The company continued to expand and eventually the wide distribution of quarries on the mainland led to the abandonment of those on Kelleys Island in the early 1940s.

Merchant Vessels. One of the earliest steam vessels associated with the limestone industry, *ISLAND QUEEN*, was built on Kelleys Island in 1854. She was a 179-ton wooden sidewheel steamer with an overall length of 121.5 ft (37 m), beam of 20.6 ft (6.3 m), and draft of 7 ft (2.1 m) (Frohman 1965:77). This vessel was owned by a stock company formed by Addison Kelley to meet the transportation needs of the Ottawa City Cement Company on Catawba Island. Investors on Kelleys Island contributed $7,000 and DeRevera St. Jurjo of Put-in-Bay $2,000 toward the original stock subscription. When completed the total cost was about $18,000, twice the amount estimated and subscribed, and she "did not pay out for five years" (Hills 1925:134,135).

The cement works at Ottawa City, located about five miles west of Kelleys Island at the northern extremity of Catawba Island, was then in full operation and shipping cement to various lake ports. The management of the company made liberal offers, in the way of freight guarantees, as an inducement to build the *ISLAND QUEEN* (Figure 3-19). The keel was laid in July on George Kelley's shore dock and she was launched in late November. After being frozen in for

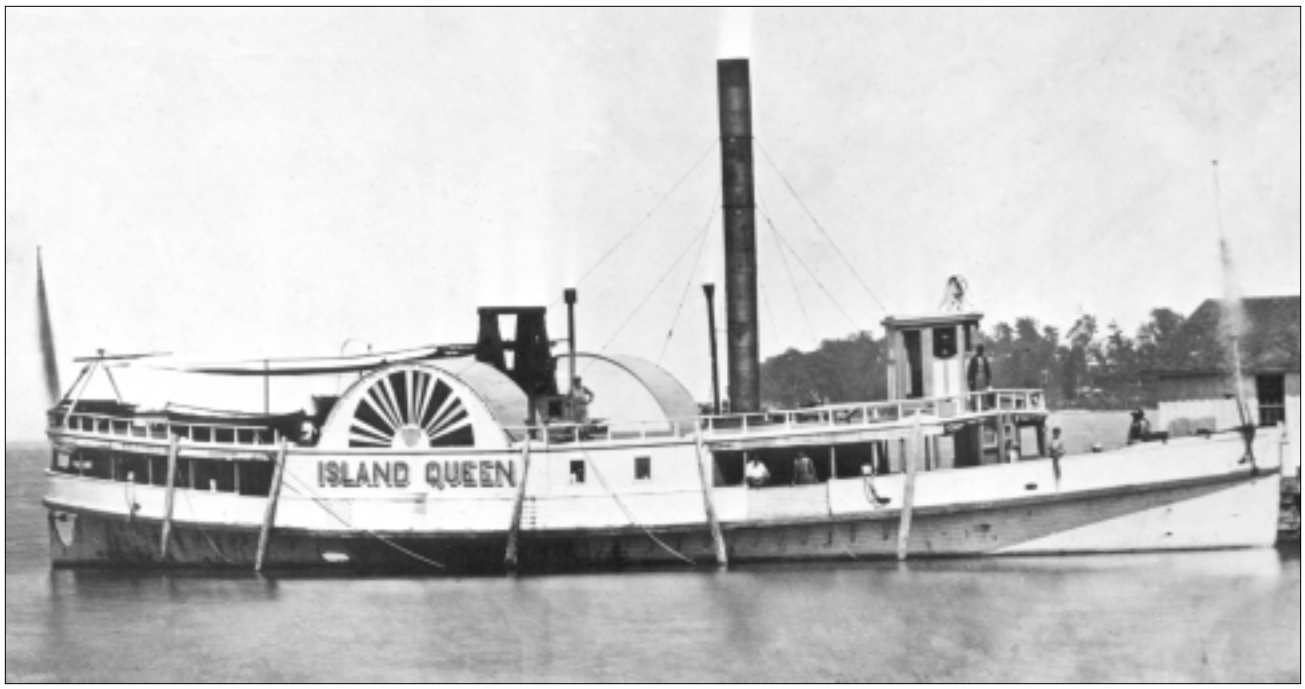

Figure 3-19. Sidewheel steamer ISLAND QUEEN*, built on Kelleys Island in 1854 (courtesy Bowling Green State University, Historical Collections of the Great Lakes).*

over a month at the island, on January 7, 1855 she was towed to Sandusky by the steamer *ARIEL* where her machinery was installed. She was powered by an upright or "Sawgate" high-pressure engine. She was ready for service in the spring of 1855 with a registered tonnage of 172. Her route included Fremont, Plaster Bed and other Sandusky Bay ports, besides Sandusky, Ottawa City, and the islands. She also went once a week to Cleveland and Toledo with cement from Ottawa City and made part of her earning by towing sailing vessels in and out of Sandusky Bay (Hills 1925:134). She was commanded by Captain Orr (Peeke 1916:340).

When the Civil War broke out the economy of the region improved and the *ISLAND QUEEN* made money. She gave up going to Fremont and began daily, instead of tri-weekly, trips to the islands except when she carried freight to Huron, Black River or some other port after completing her excursions. Only two vessels were owned by Kelleys Islanders in 1863, the *ISLAND QUEEN* valued at $5,000 and a sailboat at $150. Seven men were employed as crew for these vessels out of a total island population of 600 for that year. Peeke (1916:340) reported the coastwise exports from Kelleys Island for 1863 as follows:

Red cedar (714 cords)	$ 4,291
Limestone (390 cords)	780
Steamboat wood (3,248 cords)	4,102
Corn, wheat, and pork	2,000
	$11,173

The *ISLAND QUEEN* never met with a serious accident or suffered anything more than a broken crank shaft until she was captured by the Rebels in September 1864, in an ill-fated attempt to free Confederate officers from the federal prison on Johnson Island, and sunk on Chickenolee Reef about eight miles north of Kelleys Island (Frohman 1965:77-81). She was raised in a few days, comparatively uninjured and put back in service, but sold two years later because the growing business on the route necessitated a larger boat. She was replaced by the 340-ton steamer *EVENING STAR* (Peeke 1916:340, Hills 1925:134).

About 1860 the scow *ELMINA* was lost in a fog while engaged in carrying stone from Kelleys Island to Cleveland for her owner, Charles Carpenter (Hills 1925:135). In 1872 the steam barge *CHARLES HICKOX* was built for Calkins & Company, then owner of North Bay quarry, by H. D. Root at Lorain, Ohio to carry lime and limestone from Kelleys Island to Cleveland. Another merchant vessel, the 300-ton schooner *J. E. GILMORE*, carried stone from Kelleys Island, making regular trips up to 1884 or later. This schooner was owned by Erastus Huntington and her master, Captain Ort. Moor of Kelleys Island. Hills (1925:135) noted this vessel leaked so badly that the crew had to dump several bushels of horse manure into the water around the boat to be sucked into the seams and thereby caulk the leaks while she was in port.

Soon after the forerunner of the KIL&T Co. was organized in 1872, a fleet of five steambarges was procured at a cost of $140,000, which included the *ALBERT Y. GOWEN*, *GOOD HIT*, *HANDY BOY*, *JIM SHERIFFS*, and *TEMPEST* for an aggregate tonnage of 3,200. The steamer *JIM SHERRIFS* carried stone to Duluth while the steamer *ALBERT Y. GOWAN* transported lime to Cleveland and Detroit. Later, the steamers *DESMOND* and *ISABELLA J. BOYCE* were purchased for the Cleveland stone trade and the steamer *NORMA* for carrying freight between Sandusky and Kelleys Island. The *NORMA* was later succeeded by the steamer *EDWARD P. RECOVE.* In addition to these vessels, KIL&T Co. operated two steel barges and a tug to tow them to Cleveland loaded with limestone (Hills 1925:137).

In 1878 Norman Kelley bought the screw steamer *MONITOR* and the schooner *ONEIDA* for the limestone trade. The master of the *MONITOR* was A. Doville of Kelleys Island. This vessel served the N. Kelley & Company until the firm sold out to the KIL&T Co. in 1891 (Hills 1925:137). In 1913, KIL&T Co. operated a fleet of 10 vessels; wooden and steel barges, tugs, steamers, and sail-rigged craft were owned by the company and used to transport the limestone (Ryall 1913:187).

Port Facilities. In 1875 the Kelley's Island and Sandusky Cable Company successfully laid a submarine cable on the bed of Lake Erie between the island and the mainland. The cable was attached to an instrument in the Atlantic and Pacific Telegraph office in Sandusky and on July 8 the first message was sent from Erastus Huntington on the island to George Daniels, mayor of Sandusky (Peeke 1916:341). This communication link greatly facilitated orders for limestone products and dispatching vessels to distant markets.

When the KIL&T Co. was formed in 1886, one of the company's first requirements in developing the vast deposits of limestone on Kelleys Island was the establishment of terminals for mainland distribution. These were created in Buffalo, Cleveland, Detroit, and Duluth (Nichols 1888:23).

In the South Side quarry in the 1880s, the quarried stone was sorted into 8 to 10 grades and then conveyed to waiting vessels or corded on the docks. The stone was loaded onto vessels by horse-drawn wagons from an elevated platform, through aprons or chutes lying on either side. The docks had sufficient facilities for expeditiously loading a number of vessels at a time. Nichols (1888:22), writing of the scene at the South Side dock, reported that "vast walls [of stone] may be seen from passing steamers" and "no rubbish or loose stone is allowed to accumulate, and everything about the dock has a neat and orderly appearance seldom met with." At that time market for the limestone extended from the lower end of Lake Erie to Duluth, Minnesota.

At the North Bay quarry, burned lime was the dominant product in the 1880s. The lime was packed into wooden barrels for storage in an adjacent warehouse or loaded directly on a vessel waiting at the warehouse dock. Maritime facilities also included a concrete pocket dock which consisted of an extended jetty with an elevated track and chutes on the sides for loading boats (Figure 3-20). Barges, steamers, and other vessels of 8,000 to 10,000 tons capacity could be easily loaded from this dock in a matter of two to three hours (Ryall 1913:186).

By the 1898, KIL&T Co. operated several Shay locomotives (Lima Locomotive Works, Lima, Ohio) and 150 cars in the quarries. Four steam shovels were used in connection with the crushing plant and 8 large derricks were employed in loading the large sections of stone blasted from the limestone beds. Four docks,

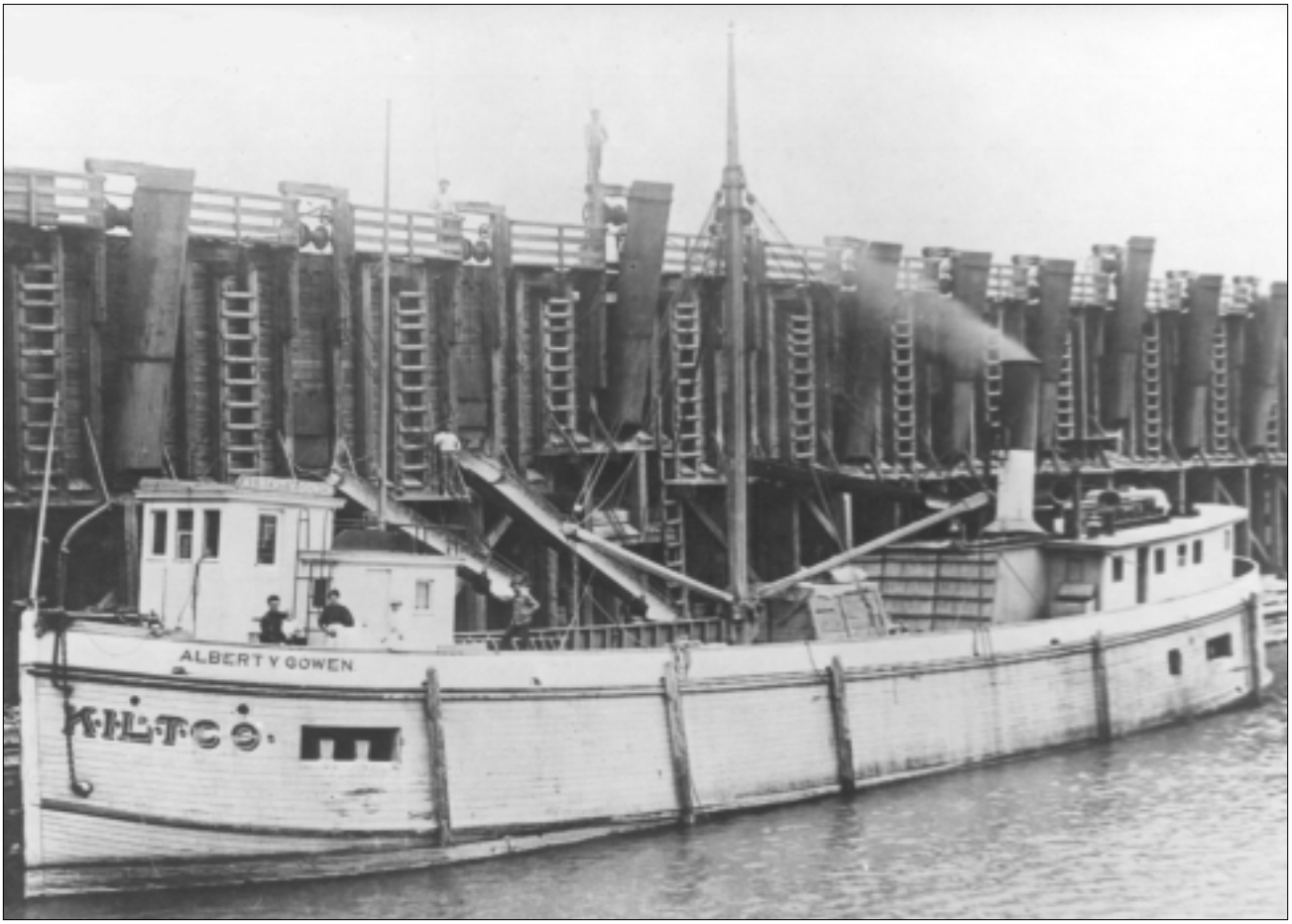

Figure 3-20. Kelley Island Lime & Transport Company's steamer ALBERT Y. GOWEN *at North Bay dock, Kelleys Island, ca. 1890 (courtesy Bowling Green State University, Historical Collections of the Great Lakes).*

lying on the north, west, and south shores, were owned by the company and afforded ample facilities for loading vessels with stone. A railway system connected all of the quarries to the docks; light engines, drawing 10 to 12 cars, were used to transport the stone. In describing the scene, Ryall (1913:186) commented that "in noise, and importance, these little engines resemble the small but mighty harbor tug, they draw heavy loads and are very busy."

Flux stone had become the major focus the island's limestone industry by the first decade of the 20th century. The increased production of flux stone necessitated the construction of improved dock and loading facilities. Because crushed stone was sold by weight, in 1907 a scale house was constructed along the rail grade connecting the stone crusher with the North Bay dock. This facility permitted large volumes of flux stone to be weighed in an expeditious manner (Myers et al. 1992:31).

The stone loading docks on the north and south shores were less used after 1910 when a central facility was constructed on the west shore. Built on the same pier site as the first Titus Quarry dock of 1842, West Bay dock was designed to accommodate narrow-gauge dumping cars via a 600-ft-long (183-m) overhead trestle (Myers et al. 1992:24). In the 1920s, stone was loaded by steam shovels into dump cars and hauled to crushers where it was broken and graded according to size. It was then reloaded into dump cars for transport to great storage bins. From the bins the stone was loaded directly by gravity into bulk freight boats. At the South Side dock the stone was loaded directly from the cars into boats (Fisher 1922:22). By the 1930s, the north and south loading docks were abandoned and all stone was dumped into freighters and barges from an elevated pier on the west shore (Figure 3-21). In the next decade quarrying operations ceased on the island and the West Bay dock was eventually dismantled. In recent years quarrying has been rejuvenated on the island and a modern conveyor system has been constructed on the "bones" of the West Bay dock.

Figure 3-21. Kelley Island Lime & Transport Company's West Bay dock, circa 1925 (Capt. Frank E. Hamilton Albums, Rutherford B. Hayes Presidential Center at Fremont, Ohio). Note Shay steam locomotives pushing narrow-gauge dumping cars, loaded with crushed limestone, via a 600-ft-long overhead trestle to storage bins at the end of the dock. From the bins stone was loaded directly by gravity into bulk freighters.